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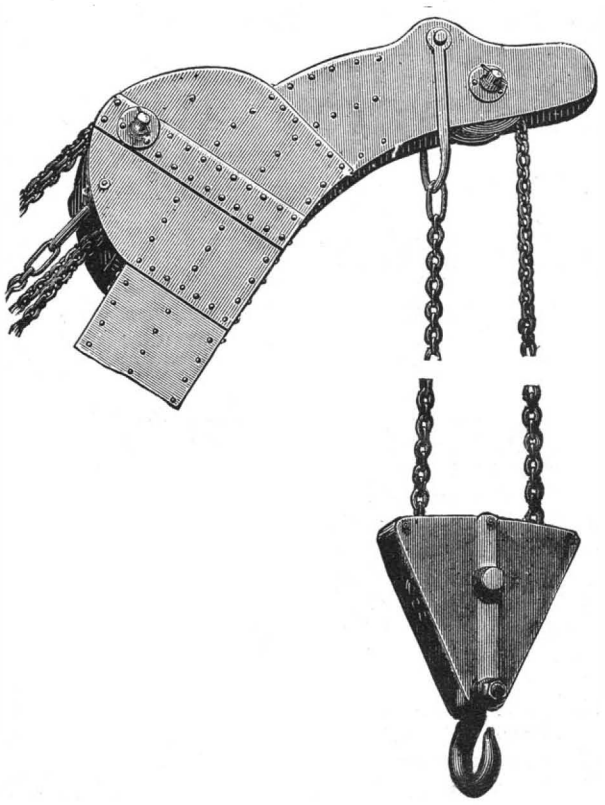
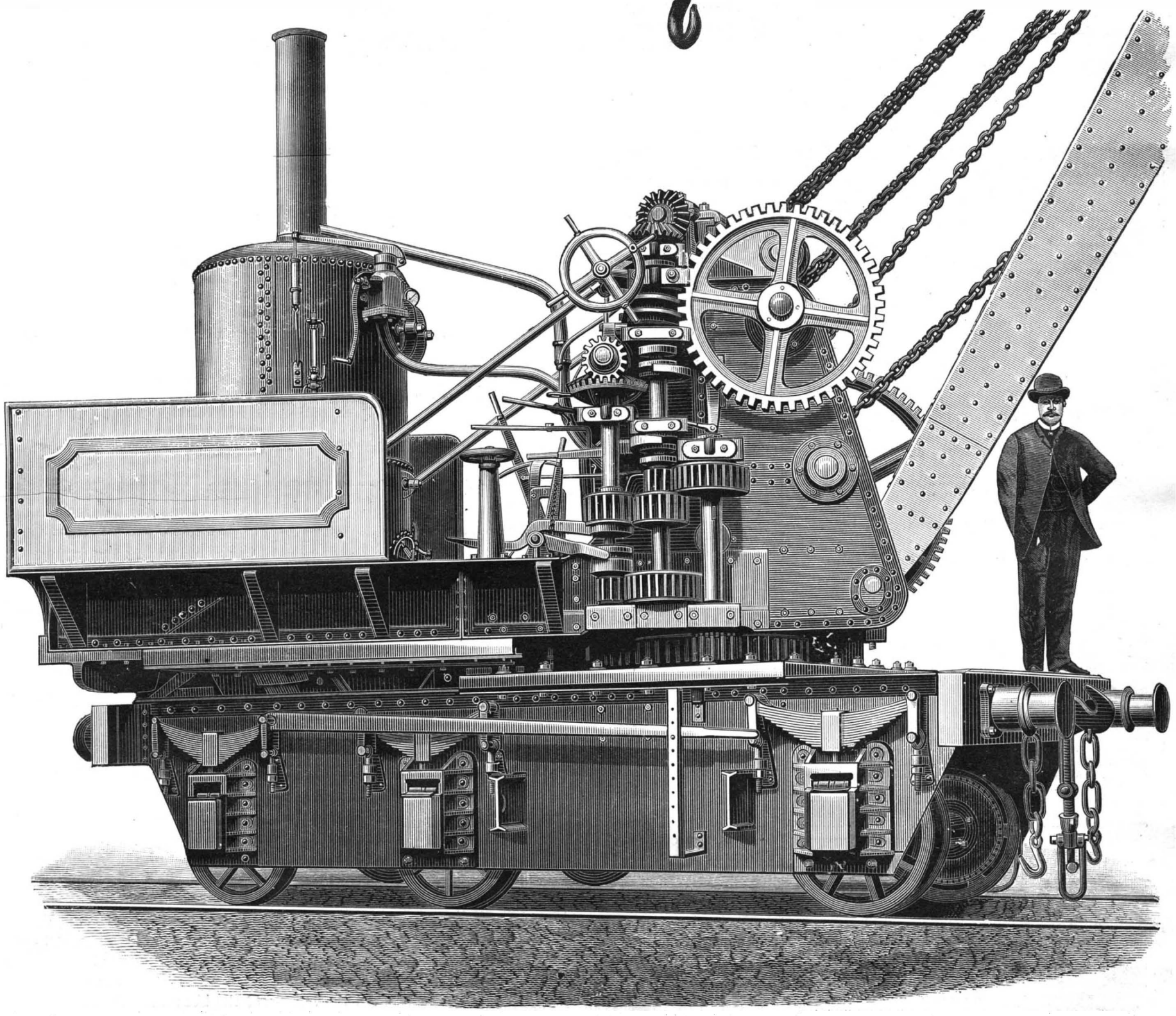
IMPROVED LOCOMOTIVE STEAM CRANE.

Our illustration shows a new English locomotive steam crane just constructed by Messrs. Chaplin for the Taff Vale Railway Company for railway breakdown purposes, but available also for general work in the locomotive yards. The *Engineer*, from which we take our engraving, says: It is one of the most powerful cranes of the class yet made, being capable of lifting loads up to twenty tons at a radius of 12 feet, or up to twelve tons at a radius of 18 feet, the height of the jib above the rails being 20 feet at the latter radius. The hoisting gear is single and double purchase, being arranged thus for lifting lighter loads at increased speed. The full load is lifted by a return block and two falls of chain. The gearing for all the four motions of (1) hoisting or lowering the loads, (2) slewing entirely round in either direction, simultaneously with hoisting or lowering when desired, (3) adjusting or altering the radius of jib, (4) propelling the crane along the rails, is worked from the engine, which has a pair of cylinders 7 inches diameter, 12 inches stroke, with link motion reversing gear. The framing which carries the engine, gearing, and boiler is entirely built of wrought iron plates and angles, as is likewise the jib, which is curved to gived more headroom in lifting bulky articles. The boiler is of the vertical class, having cross tubes in the firebox, and tested to double the working steam pressure. The carriage is built of wrought iron, and fitted with six wheels and the usual standard permanent way draw gear, springs, and buffers.



The Capitol Building, Albany.

A resolution has been presented in the Assembly, asking an appropriation to provide for the removal of the boilers under the capitol, as it has been found that they may blow up at any moment and send the members flying above the dome. A contemporary observes that since the Legislature moved into the new capitol, in spite of its splendor, the members have hardly found life so pleasant as did their predecessors in the old building. They have been threatened from above and below. First there was the prospect of the stone roof falling on the heads of the members of the Lower House, and to avert that catastrophe the architect, at his own cost, undertook to repair the weakness. Now it is ascertained that the boilers may some day explode, and in their flight produce greater damage than dynamite did in the House of Commons. The new capitol is a very imposing edifice, but it has some features not calculated to tranquilize the nerves of timid persons who are forced to remain within it for hours at a stretch.



IMPROVED LOCOMOTIVE STEAM CRANE.

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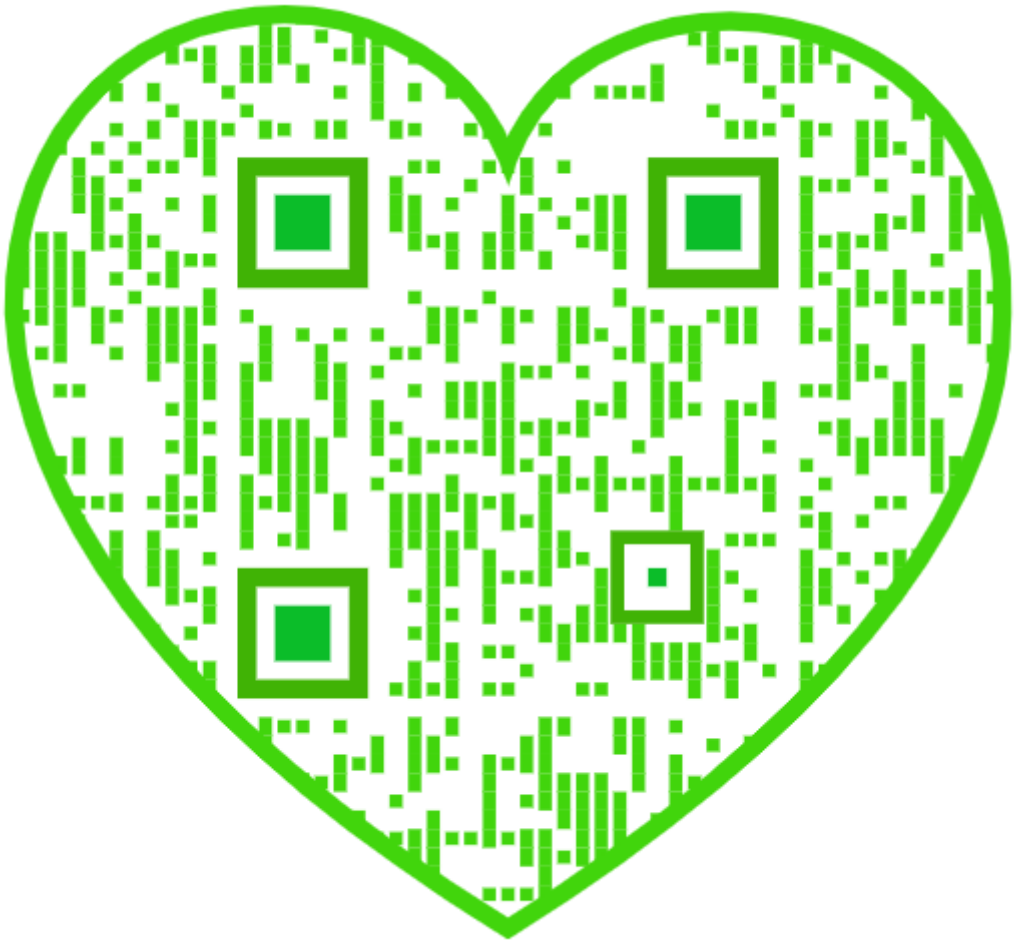

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NEW YORK, SATURDAY, FEBRUARY 28, 1885.

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THE COMMISSIONERSHIP OF PATENTS.

The incoming of the new administration involves the appointment of a new man as Commissioner of Patents. The duties of this officer are of the highest importance, and great care should be taken in the selection of the individual. The Commissioner makes the rules that govern his subordinates in the transaction of all Patent Office work; he determines whether old and slow modes shall be followed, or whether promptness and activity shall prevail. Upon him falls almost the entire responsibility of the bureau in all its workings.

Among the best names mentioned in connection with the Commissionership is that of the Hon. R. B. Vance, of Asheville, North Carolina. He is a gentleman of ripe experience and marked ability, possessing many qualities admirably suited to the requirements of the position. He is a man of great integrity, honor, and uprightness, and withal a good business man. He has been a member of the Committee on Patents of the House of Representatives for ten years, and chairman of the same committee for eight years. He is familiar with the working and needs of the Patent Office, and appreciates the necessity for a change by which the present ruinous delays of business shall be swept away. Like the new President-elect, Mr. Vance is a man of untiring industry. He enjoys the esteem and confidence of a large constituency. We believe his appointment as Commissioner of Patents would be hailed with general satisfaction throughout the country.

BUILT-UP MILLS.

Machinists have their notions, and perhaps no other tradesmen are more ready to indulge them. Something has already has been said in these columns about the material and the forging of milling machine tools, but nothing has been said about mills being built up when their sections were of the same diameter. Yet this is the system pursued by a very competent machinist. He makes up his straight mills from thin disks, and arranges them on the arbor so that the teeth zigzag, or alternate. For instance, a straight mill for flat work, to cut two inches wide, instead of being forged in one piece, or cut in one chunk from a bar, is made up of eight or nine disks of one-quarter inch thickness, faced and screwed together on the arbor, and turned and cut as one solid mill. The disks are then taken apart and tempered, and when returned to the arbor they are set so that the teeth break joints. When the mill is to be ground by the emery wheel, the tightening set-up nut is loosened and the teeth of the disks moved into line by a steel straight-edge. They can then be ground across on a continuous line, as though they were cut on a solid block. It is easy enough to disarrange the disks so that their teeth shall alternate, and to set them in this position.

The claim for this divisional mill is that it cuts faster and freer because of the alternation of the disks as regards the teeth; that there is no give or spring to the arbor by the alternate cut and let-up of straight-across teeth; that any section of one-quarter of an inch thickness, or of one-eighth of an inch, can be readily removed when broken; and that by using these thin disks mills may be built up of any required width (length) whenever the exigencies of the work require, without the necessity of making new solid mills. This is an experiment of an old machinist, who believes that it is an improvement on the solid mills, but who makes no claim to a control of the device, and no claim to its originality.

A TRADE AS A REFUGE.

Many years ago the writer was foreman of a machine shop in Boston, Mass., and one day had an application for apprenticeship from a young man who was accompanied by his uncle. The latter carefully explained that his nephew did not expect to be a machinist for a living, as there was ample means for his support outside of the workshop; but he wanted to learn the trade, so as to be independent of circumstances. The propriety of the intention of the young man and his uncle was recognized; but the exaction was made that the apprentice should travel the same road that impecunious and needy young men traveled; there was no royal road or short cut to mechanical success for lads of great expectations. These plain truths—very plainly presented—suited the applicant and his relative, who was at that time a United States Senator, and subsequently became a candidate for a still higher office.

The young man came into the shop, was treated the same as the other apprentices, was instructed as though he was to become a machinist and follow the honorable business for a living. But he disregarded shop hours; he sneered at shop rules; he came and went as he chose; and finally, six years after, he was usher at a second rate theater. He was not cut out for an amateur mechanic.

His experiment as an embryo mechanic illustrates the nonsense frequently talked in public and published in print—that the experimental knowledge of a trade or business is sure defense against possible disaster, and secures the journeyman-apprentice a chance for an income from his trade. The notion is as fallacious as would be that of every graduate from a college claiming the qualifications for a professor.

It is well enough that yong men should learn some means of supporting themselves by their own exertions, but it is folly to imagine that because a boy has soiled his overalls against a lathe and dirtied his hands with oil and filings, he is necessarily a mechanic, and can return to his shop, as to a "city of refuge," when misfortune overtakes him.

No mechanic is worthy the name who does not keep abreast with the improvements in the shops. To do so, he must either work in the shop or be a frequent visitor. It is astonishing to men—practical mechanics—who write for publication to their brother mechanics, to see how the changes and possible improvements in shop methods and shop tool: keep apace with their growing years. The sixty year old proprietor of a well known manufactory said, recently, that he was surprised every day when he compared what was being done in his own establishment with what he knew how to do thirty-five years ago; and this man is one of the liveliest mechanics and prolific inventors of the country. It is evident, from observation, and it is convincing from experience, that a learned trade should be a practiced trade to be of real use.

A Clergyman on Shavings.

Rev. Dr. Paxton, in a lecture before the Mechanics' and Tradesmen's Union, of this city, a few evenings ago, stated in a few words a good many truisms. Shavings, the lecturer said, were not of American invention, like whittling, but were as ancient as the working of metals by Tubal Cain. They are the necessary waste of every work. There is a certain loss from every gain; there is no building without its rubbish heap to remove, which requires almost as many carts as to bring the building material. The fewest substances in nature are found pure. Construction is based upon destruction. Every joy presupposes a sorrow. The door posts of progress are sprinkled with the blood of its martyrs, and along the way are scattered like millstones the bodies of those who have fallen in the path. We cannot get something for nothing; for every tit there is a tat. The wrecks of rich men's sons to be seen everywhere show that it is as hard to keep as it is to get. Without toil there is no substance; hence the recklessness with which estates are squandered, without any regard for the toils and hardships that had to be undergone to procure them. It may be likened to the sacrifice of human life at the battle of Bunker Hill, through which the salvation of our country was procured.

The Chicago Electrical Fire Alarm.

Mr. Wm. H. Preece, who is now the Chief of the Government Telegraph Service in London, visited this country in 1877, and last year he came over again to attend the meeting of the British Association in Montreal. In a recent meeting of the Society of Telegraph Engineers and Electricians, in London, he described the Chicago fire alarm operation as follows:

Some members present may remember that, when I described my last visit to America, I mentioned how in Chicago the fire alarm was worked by an electric method; and I told you a story then that you did not believe, and which I have told over and over again, but nobody has yet believed me, and I began to think that I must have made a mistake somewhere or other. So I meant, when at Chicago this time, to see whether I had been deceived myself. There was very little room for improvement, because, as I told you before, they had very near reached perfection. This is what they did: At the corner of the street where a fire alarm box is fixed a handle is pulled down, and the moment that handle is released a current goes to the fire station; it sounds a gong to call the attention of the men, it unhitches the halters of the horses, the horses run to their allotted positions at the engine, it whips the clothes off every man who is in bed, it opens a trap at the bottom of the bed, and the men slide down into their positions on the engine. The whole of that operation takes only six seconds. The perfection to which fire alarm business has been brought in the States is one of the most interesting applications of electricity there.

Notice to New Subscribers.

Most subscribers to this paper and to the SCIENTIFIC AMERICAN SUPPLEMENT prefer to commence at the beginning of the year, Jan. 1, so that they may have complete volumes for binding.

Those who desire it can have the back numbers of either edition of the paper mailed to them, but unless specially ordered, new subscriptions will be entered hereafter from the time the order is received.

Bound volumes of the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT for 1884 may be had at this office, or obtained through news agents.

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ASPECTS OF THE PLANETS FOR MARCH.

SATURN

is evening star, and takes his turn in coming to the front on the March records. A noteworthy event occurs in his course as viewed from this planet. On the 7th, at 3 o'clock in the afternoon, he is in quadrature with the sun on the eastern side. On that occasion, when the solar orb sinks below the western horizon, Saturn looks down from the zenith, 90° east of the great luminary. "Soon as the evening shades prevail," and the stars peep from their hiding places in the fathomless depths, the planet, second in size of the sun's family, and by far its most wonderful member, may be seen beaming radiantly from the celestial heights and commencing his westward descent. He is indeed a shining light under his present conditions, and may be readily recognized by the serenity and purity of his rays and the soft golden tint that distinguishes him from the twinkling points surrounding him. Were he an earthly potentate, he could not choose a more commanding position for holding his court than the one he occupies at sunset when in quadrature. For, poised on the height of the celestial dome, he holds under his sovereign sway the most brilliant galaxy of stars the heavens display to mortal vision. On the north, the northern brilliant Capella forms his body guard. Equidistant on the south, Betelguese shines, the leading brilliant of superb Orion, who, girded with belt and sword, treads the celestial path with starry feet, stretching his vast bulk over the equator, and dotting the sky with a starry glory visible all over the globe. The peerless Sirius, member of the highest order of suns in space, glows in the southeast. On the west, the clustering Pleiades softly shine, translated to the skies for sisterly devotion, and red Aldebaran looms into view. On the east, Procyon points north to Castor and Pollux, and still farther east the starry Sickle comes into view, while, crowning the starlit scene, Jupiter rises toward the meridian in the plenitude of his power, and in the regal aspect he assumes on his nearest approach to earthly domain.

The observer who beholds Saturn under these conditions gazes upon a magnificent picture of starlit beauty. Every star that has been mentioned may be readily traced with the aid of a chart. The moon will not dim the luster of the stars, and, choosing the whole year through, no more brilliant page of the celestial book will be thrown open to the upturned eye than the one we have attempted to describe, when Saturn soon after sunset looks down from the high heavens above upon this little planet plowing her way through space and turning on her axis as she spins on in her course.

Observers skilled in planetary lore see evidences of change and commotion in the ring-girdled orb. Astronomers of high repute think that the rings are drawing nearer to the planet, and will eventually fall upon it. Others of equal renown—and here the evidence strengthens and accumulates—feel sure that great changes are taking place in the dimensions and density of the golden girdle, unique in the universe so far as our observation extends. The theory is generally accepted that the Saturnian rings are made of myriad satellites forming a kind of cloud, that the divisions of the ring are real, and that we see between them the black background of the sky. A different theory finds advocates, who think that the whole ring is opaque, and that the apparent opening is due to the darker shading of that portion of it. If a star could be seen shining through the dark space between the outer and inner ring, the problem would be solved. But no twinkler has thus far made its appearance between the bright boundaries of the golden circlets, and furnished the indisputable evidence required. The nearest approach to the much desired solution was made 1707–8, when a star was seen between the rings and the body of the planet, and when Dawes, called the eagle-eyed, saw a small star pass behind the outer edge of the outer ring.

The ball of the planet presents similar phenomena to those observed in Jupiter. There are belts and spots and rifts indicating great disturbances, and the same process of world-making. As, however, the planet is double the distance, the observation is more difficult, and on a smaller scale.

The present is the golden opportunity for a close study of the Saturnian system. Some of our best observers are improving every hour fitting for telescopic work, and tidings coming from the distant orb will quickly be proclaimed, for astronomical tidbits are rare in these days, and the discoverer is sure of immortal fame. Mimas would afford a favorable standpoint for observation. It is the innermost of the eight satellites, makes its revolution round the planet in less than 23 hours, and is only 32,000 miles from the edge of the outer ring. A spectator on Mimas would behold the whole system of rings and the planet softly cradled within them, a vision of such sublimity and magnificence that finite fancy is powerless to paint its transcendent loveliness.

The right ascension of Saturn on the 1st is 5 h. 6 m.; his declination is 21° 38′ north; his diameter is 17·6″; and he is in the constellation Taurus.

Saturn sets on the 1st at half past 1 o'clock in the morning; on the 31st he sets at half past 11 o'clock in the evening.

URANUS

is morning star until the 21st, and then becomes evening star. He wins the second, if he does not deserve the first, place on the monthly record, for during the month he reaches the period of his short-lived importance. On the 21st, at 3 o'clock in the morning, Uranus is in opposition with the sun, after which event the four giant planets are all on the eastern side of the sun, and play the part of evening stars in the following order: Neptune, Saturn, Jupiter, and Uranus.

This distant planet, 1,800,000,000 miles away, is visible to the naked eye at opposition and for a short time before and after. He appears as a star of the sixth or smallest visible magnitude, and the observer must know his exact position in order to be successful in his search.

Uranus, on the 21st, is in the constellation Virgo, 10′ west and 23′ north of Eta Virginis, a star of the third magnitude in the wing of the Virgin. It is incomprehensible that a planet visible to the naked eye should have wandered over the sky so many years without being picked up by some sharp-sighted star gazer, and that the discovery should finally be made by accident. A good telescope will bring him out as a charming object, in his garment of sea-green hue, and exceptional visual power may discern the shadowy belts that diversify his disk.

The right ascension of Uranus on the 1st is 12 h. 7 m.; his declination is 0° 2′ north; his diameter is 3·8″; and he is in the constellation Virgo.

Uranus rises on the 1st soon after 7 o'clock in the evening; he sets on the 31st soon after 5 o'clock in the morning.

JUPITER

is evening star. His brilliancy does not perceptibly wane, and he remains lord of the ascendant during nearly the whole night, setting a short time before the day breaks. He is now retrograding, and traveling north. On the 14th he is in conjunction with Regulus, passing 51′ north. He is near the star throughout the month, being on the east of it till the 14th, and then on the west. Thus by watching the star, fixed in its position, the wanderings of the planet will be plainly perceptible. The Prince of Planets was superb in February, and will be equally so during March. We can find no new words to describe the grandeur of his starry splendor to the naked eye, and the surpassing beauty he takes on in the telescope.

The right ascension of Jupiter on the 1st is 10 h. 8 m.; his declination is 12° 52′ north; his diameter is 42·6″; and he is in the constellation Leo.

Jupiter sets on the 1st about 6 o'clock in the morning; on the 31st he sets a few minutes before 4 o'clock.

VENUS

is morning star. She anticipates the sun only about half an hour in rising, thus showing how close she is to him and how soon she will be entirely lost in his rays. The fairest of the stars will be a blank for months to come as far as observation is concerned. She gives, however, evidence of her usual activity, by paying her respects to Mars, the new comer among the morning stars. The planets are in conjunction on the 27th at 10 o'clock in the evening, Venus being 36′ south. The conjunction will be invisible for a double reason. The planets are below the horizon at the time, and too near the sun to be visible under any circumstances.

The right ascension of Venus on the 1st is 21 h. 55 m.; her declination is 13° 50′ south; her diameter is 10·6″; and she is in the constellations Aquarius and Pisces.

Venus rises on the 1st at a quarter before 6 o'clock in the morning; on the 31st she rises at a quarter after 5 o'clock.

MARS

is morning star, and is still close to the sun, rising a few minutes before him. Besides his conjunction with Venus, already referred to, he is in conjunction with Mercury on the 7th at 9 o'clock in the morning, being at that time 1° 3′ north. It will be readily seen that Venus, Mars, and Mercury are near each other and near the sun in the month of March.

The right ascension of Mars on the 1st is 22 h. 37 m.; his declination is 13° 50′ south; his diameter is 4·2″; and he may be found either in Aquarius or Pisces.

Mars sets on the 1st at a quarter after 6 o'clock in the morning; on the 31st he sets at a quarter after 5 o'clock.

MERCURY

is morning star until the 13th, when he becomes evening star. On the 13th, at 1 o'clock in the afternoon, he is in superior conjunction with the sun, making the fifth in the list of evening stars.

The right ascension of Mercury on the 1st is 22 h. 22 m.; his declination is 12° 29′ south; his diameter is 4·8″; and he may be found either in the constellation Aquarius or Pisces.

Mercury rises on the 1st soon after 6 o'clock in the morning; he sets on the 31st at half past 7 o'clock in the evening.

NEPTUNE

is evening star during the month.

The right ascension of Neptune on the 1st is 3 h. 15 m.; his declination is 16° 18′ north; his diameter is 2·5″; and he is in the constellation Taurus.

Neptune sets on the 1st about half past 11 o'clock in the evening; on the 31st he sets soon after half past 9 o'clock in the evening.

THE MOON.

The March moon fulls on the 30th, at 39 minutes after 11 o'clock in the morning. She is the queen of the full moons for the whole year, being the first moon that reaches her rounded outline after the vernal equinox. She therefore determines indirectly when Easter Sunday shall fall, and consequently regulates the movable feasts and fasts of the Church. Our nearest celestial neighbor, the moon, thus exerts a great influence on human affairs.

The moon is in conjunction with Uranus on the 2d, with Venus on the 15th, and with Mars on the 16th. The new moon of the 16th is in conjunction with Mercury on the day of her change, with Neptune on the 20th, with Saturn on the 23d, with Jupiter on the 27th, and closes the list with a second conjunction with Uranus on the 27th.

ANNULAR ECLIPSE OF THE SUN.

An annular eclipse of the sun will take place on the 16th, that will be visible as a partial eclipse throughout North America and adjacent portions of the Pacific and Atlantic Oceans. The path of the annular eclipse commences in the Pacific Ocean, crosses California, Idaho, Montana, Manitoba, Hudson's Bay, Greenland, and ends north of Iceland. Observers on this path will behold the sun's face eclipsed with the exception of a ring of light around the edge. In this case, the center of the moon passes directly over the center of the sun, but the apparent magnitude of the moon is less than that of the sun, and therefore she cannot eclipse the whole disk. An "annulus," or ring, is left. The phenomenon is weird and beautiful, but bears no comparison in awe-inspiring intent and sublimity to a total solar eclipse.

The eclipse is visible as a partial eclipse in this vicinity. For New York standard time:

	H. M.
It begins	0:14
It ends	2:51

The magnitude of the eclipse is 0·537 of the sun's diameter, and is on the sun's north limb.

ECLIPSE OF THE MOON.

There will be a partial eclipse of the moon on the 30th, invisible in the United States, but visible in Asia, eastern Europe, and Africa. The magnitude of the eclipse is 0·886 of the moon's diameter.

The Late William A. Gellatly.

By the death of Mr. Gellatly this city is deprived of one of its best merchants, and Llewellyn Park, N. J., where he resided, one of its best citizens. For many years active manager of the large drug house of Wm. H. Schieffelin & Co., he occupied a position which his talents and perseverance alone had given him. He was born in Scotland in 1831, and was brought to this country when four years of age. The beginning of his career may be reckoned from his thirteenth year, when he attracted the interest and attention of Mr. H. H. Schieffelin during a recitation at one of the public schools, and so pleased the gentleman that the latter immediately engaged him as an errand boy in his office. He was rapidly advanced, however, and passed quickly from one position of trust to another, until he was received, in 1860, into the firm which had trained him and brought him up, and had been wise enough to appreciate him.

Mr. Gellatly was a member of the Chamber of Commerce, a director of the Board of Trade, and a late president of the National Drug Association, all which positions, however, pale before his marked characteristics as a man, for there could not be found one more gentle, loving, kindly, yet strong, firm, wise, and determined in right doing than this ever-active, never-tiring worker.

The death of Mr. Gellatly has cast a gloom over a large circle of friends as well as a delightful household.

Another Inventor Gone.

B. B. Hotchkiss, inventor of the famous gun bearing his name, died on 14th inst., in the fifty-fifth year of his age, in Paris, where he was engaged in the manufacture of his weapons of war. Mr. Hotchkiss was a native of Connecticut, and in early life was employed in Sharp's rifle factory and afterward in Colt's armory at Hartford, Conn., where he assisted in the perfecting of the celebrated Colt revolving pistol. Mr. Hotchkiss invented what is known as the Hotchkiss magazine gun, which was intended especially for use in the rigging of vessels.

The deceased had become quite famous for other inventions in the ordnance and projectile line, and he had established in Paris some ten years ago a factory for manufacturing his inventions, which establishment had grown to extensive proportions under his energetic management. Mr. Hotchkiss was a warm friend of the SCIENTIFIC AMERICAN, and he furnished for the paper the earliest information respecting his inventions. It is to be regretted that he should be cut off so suddenly in the midst of his usefulness.

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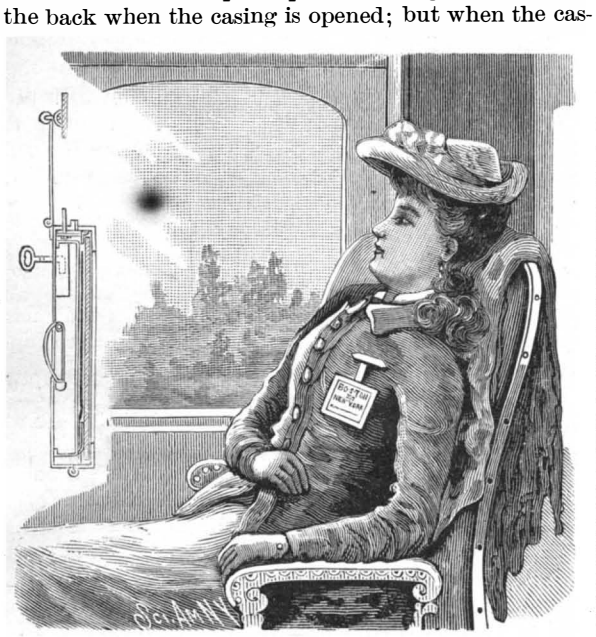
RAILROAD TICKET HOLDER.

A flat casing, made of metal, rubber, or other material, is provided with a hinged front, adapted to swing downward, in which is held a pane of glass. On the inner surface of the back of the casing is a lock, the bolt of which catches on a spring catch and prevents the opening of the casing. The ticket is held against a spring band, secured transversely on the inner surface of the casing, by a small spring piece projecting upward in front of the lower part of the band. A pin, passing through apertures in the back, has its point and eye on the inner surface of the back; the outer part can be passed through the coat or other garment of the wearer. The pin is passed through the holes in the back when the casing is opened; but when the casing is locked, the pin holds it in place and makes it impossible to detach it. By means of a link the casing is suspended from a piece provided with a pin, by which the holder can be hung on the coat or dress in such a position that it can be easily seen by the conductor. The sectional engraving shows the construction of the holder.

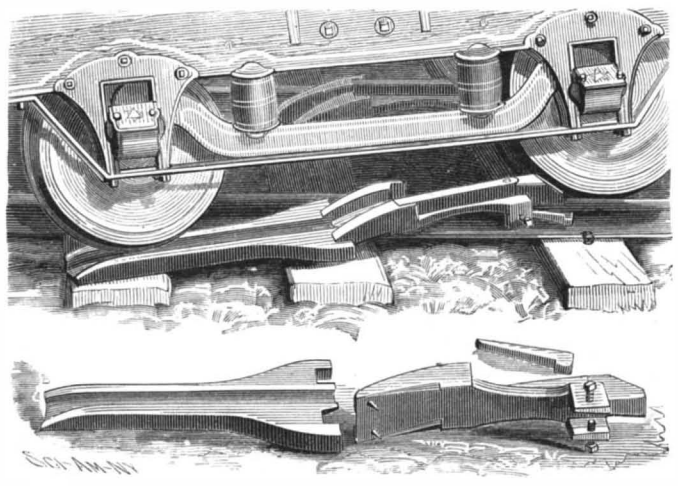


CILLEY'S RAILROAD TICKET HOLDER.

This invention has been patented by Mr. Sherburn E. Cilley, of Turnbridge, Vt.

CAR REPLACER.

By means of the device herewith illustrated, cars and locomotives can readily and with comparative ease be replaced upon the track when derailed. The upper engraving shows the parts of the replacer in position, while those below show the parts separated. Upon the wide end of the frog are formed track flanges having rabbets at their inner ends; to the opposite end is pivoted one end of a tongue of such length that it extends to and fits into one or the other of the rabbets. The pivoted end of the tongue is shaped as shown in the cut. Upon each side of the frog, at the pivot end, is a downwardly extending lug, each provided with a set screw, and by the aid of which the end of the tongue may be adjusted exactly over the rail, a wedge being inserted between the lug—on that side of the rail from which the frog extends—and the web of the rail. The tongues, being then swung to have their free ends in the rabbets, will form continuous bearings for the wheels from the flanges to the rails. By this arrangement of the flanges, the tongue, the lugs, and by the use of the wedge, the frog can be adjusted for use either as a right or left hand frog, as the case in hand may require. Upon the under side of the lower end of the frog are prongs to be forced into one of the ties, to assist in holding the frog in place. The extension piece is a tapering plate having side flanges beveled at the thin end. The plate and flanges are made wider at the thick end of the plate, in which recesses are formed to pass upon the flanges of the frog. The under side of the plate is beveled to fit upon the adjoining part of the frog. One of these extension pieces is used with each frog.



JONES' CAR REPLACER.

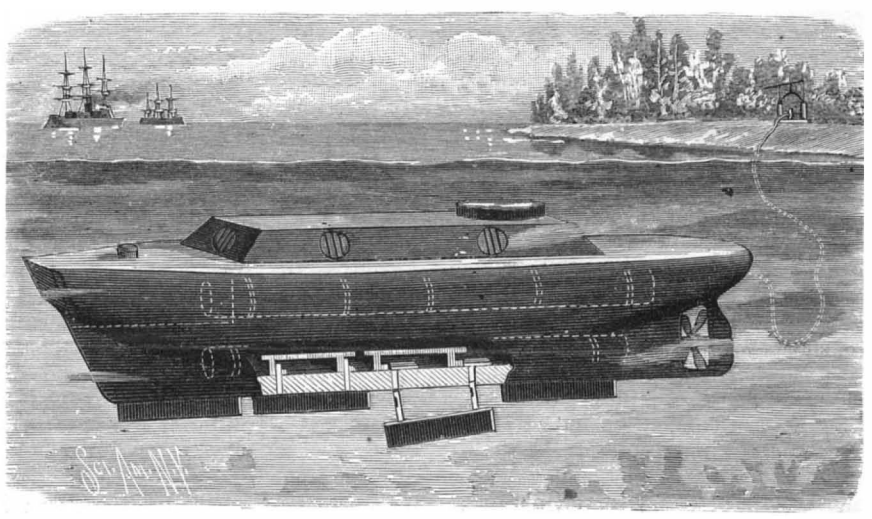
This invention has been patented by Mr. Robert Jones, whose address is P. O. box 1059, Salt Lake City, Utah.

KEEL FOR SUBMARINE BOATS.

The boat is provided with air tubes, water tanks, a detachable keel, a propeller, rudder, and a torpedo box, all adapted to work together and to be controlled by attendants within the boat; by these means the boat may be raised and lowered, or suspended at any point and may be removed to any location. The detachable iron keel is constructed of one or more parts provided with lugs, which pass through slots made in the keel of the boat. Suitable slide valves prevent the water from entering the boat when the detachable keels are dropped. The water tanks have valves to admit and discharge the water, and hose couplings to admit the air, and are used in combination with the air tubes and detachable keel to raise and lower the boat in the water. The air supply is received from an air pump placed either on shore, on a second boat, or in the submarine boat. At one end of the boat is a torpedo box that may be used as a place from which to work a drill to bore holes into a ship, for the purpose of introducing explosive material. This box is provided with water tight doors, which are used when preparing and liberating a torpedo beneath a vessel. An armor plated shell on top of the boat is used when the latter is employed in torpedo service.

The air tubes are partially filled to balance the weight of the extra keel, and the boat is moved to the place where it is desired to sink it. Water is then admitted to the tanks, and the air is allowed to escape; the boat sinks, and the equipoise is maintained by the inflation or discharge of the air cylinders, shown by the dotted lines. The boat is then moved forward under water by means of the propeller.

Further particulars regarding this invention can be obtained by addressing the patentee, Mr. Walter Hammond, of 409 Lanvale Street, Baltimore, Md.



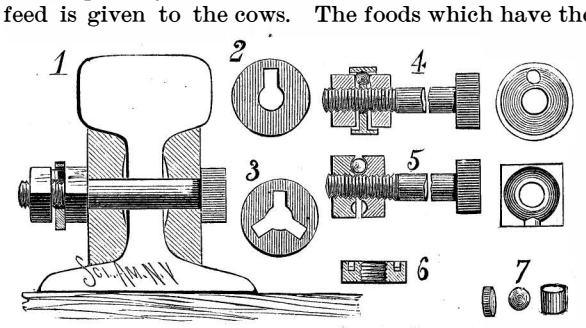
HAMMOND'S KEEL FOR SUBMARINE BOATS.

IMPROVED NUT LOCK.

The invention shown in the engraving, recently patented by Mr. James A. Campbell, of Brenham, Texas, consists of a friction roller held loosely between two nuts, or between a nut and any object to be held by the bolt, and which binds the nut upon the bolt, and locks it when the lock nut is screwed down. Between the nut and nut lock is placed a washer formed with a rectangular recess, Fig. 2, which receives a cylindrical roller. In Fig. 3 the washer has three recesses. In Fig. 4 the washers are provided with circular apertures for receiving spherical rollers; this washer is formed with a rim covering the space between the nuts, to keep out dirt.

In Fig. 5 the nuts each have an annular groove for retaining a spherical roller, and one of them may have a short groove extending to the edge of the nut. The nut Fig. 6, is formed with a rectangular groove, and when two are placed together the grooves receive a flat, disk-like roller. Instead of using a tightening nut and nut lock, only one nut may be used, with the roller between the nut and the object to be secured. The washers are intended to be used between the fish plate or other object and the tightening nut, so that their rollers will prevent the fish plate from turning the nut by any movement it may have imparted to it.

When a spherical or disk roller is used without a washer, and with but one nut, the face of the object is grooved to correspond with the nut. With nuts having annular grooves, Fig. 5, the nut can be screwed nearly to place, and the roller then inserted through the groove leading to the edge. Fig. 7 shows forms of friction rollers. This nut lock is simple and sure in its operation, and can be varied in form as circumstances may require.



CAMPBELL'S IMPROVED NUT LOCK.

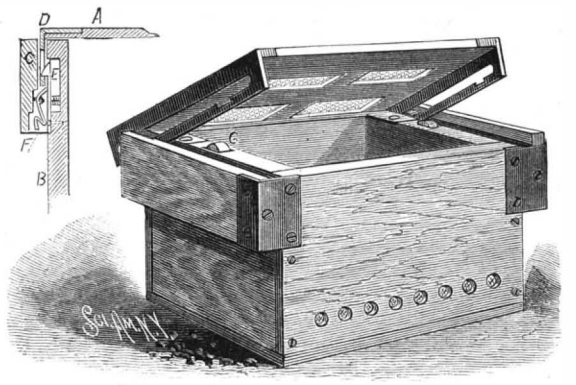
A Good Disinfectant.

The following compound has been presented to the Berlin Medical Society for purifying the atmosphere of the sick room:

Oils of rosemary, lavender, and thyme, in the proportions of 10, 2½, and 2½ parts, respectively, are mixed with water and nitric acid in the proportion of 30 to 1½. The bottle should be shaken before using, and sponge saturated in the compound and left to diffuse by evaporation. This compound is said to possess extraordinary properties in controlling odors and effluvia.

IMPROVED SHIPPING CASE.

The cover of the box is formed with end flanges, each having a longitudinal slot in the bottom edge of which, a short distance from the front end, is a recess. Passing through the slots are pins projecting from angle pieces secured on the top rear edges of the end pieces. On the outer surface of each end piece is a guard, C, formed with a recess to receive one of the cover flanges. On the inside of the guards are upright plates, formed with holes, in which the threaded ends of the pins can be screwed, thereby forming a support for the outer ends of the pins, and also firmly holding the inner ends of the guards. In the top edges of the ends, rollers, G, are journaled, on which the cover can slide.



MITRUCKER'S IMPROVED SHIPPING CASE.

When the cover is closed, the flanges rest in the grooves, and the hooks of springlatches, E (the sectional view shows the construction and position of the latches, and also that of the lever by which the latch hooks may be forced away from the recess in the longitudinal slot), rest in the bottom edges of the slots, thus holding the cover. When the box is to be opened, the fingers are placed in the V-shaped plates, F, formed on the lower end of a pivoted lever; the lever is moved away from the box, thereby pressing the upper ends of the hooks away from the notches in the flanges. The cover can be swung down against the back of the box, the rollers on the pin holding it in a vertical position. In closing the box the latches automatically catch on the edges of the slots. The cover can be opened more or less, as desired, can be pushed back, or can be raised. The cover flanges prevent damage to the box from the driving of nails through the cover.

This invention has been patented by Mr. Christian Mitrucker, whose address is care *Illustrated Staats Zeitung*, Chicago, Ill.

Bad Flavor in Milk.

Complaint is often made at the disagreeable taste of milk, especially in the autumn, when succulent or green feed is given to the cows. The foods which have the most marked effect on the flavor of milk are turnips and cabbages, many farmers feeding turnips throughout the year. Investigators of the subject recommend the use of boiling water to eradicate the unpleasant taste. While the adulteration laws of this and other cities may not allow its use by dealers, the consumer has the privilege of watering his own milk. To every gallon of new milk a pint of boiling water is recommended, and it is said it will almost invariably remove any flavor caused by any particular food on which the cows have fed.

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IMPROVED BACK-WASHING MACHINE.

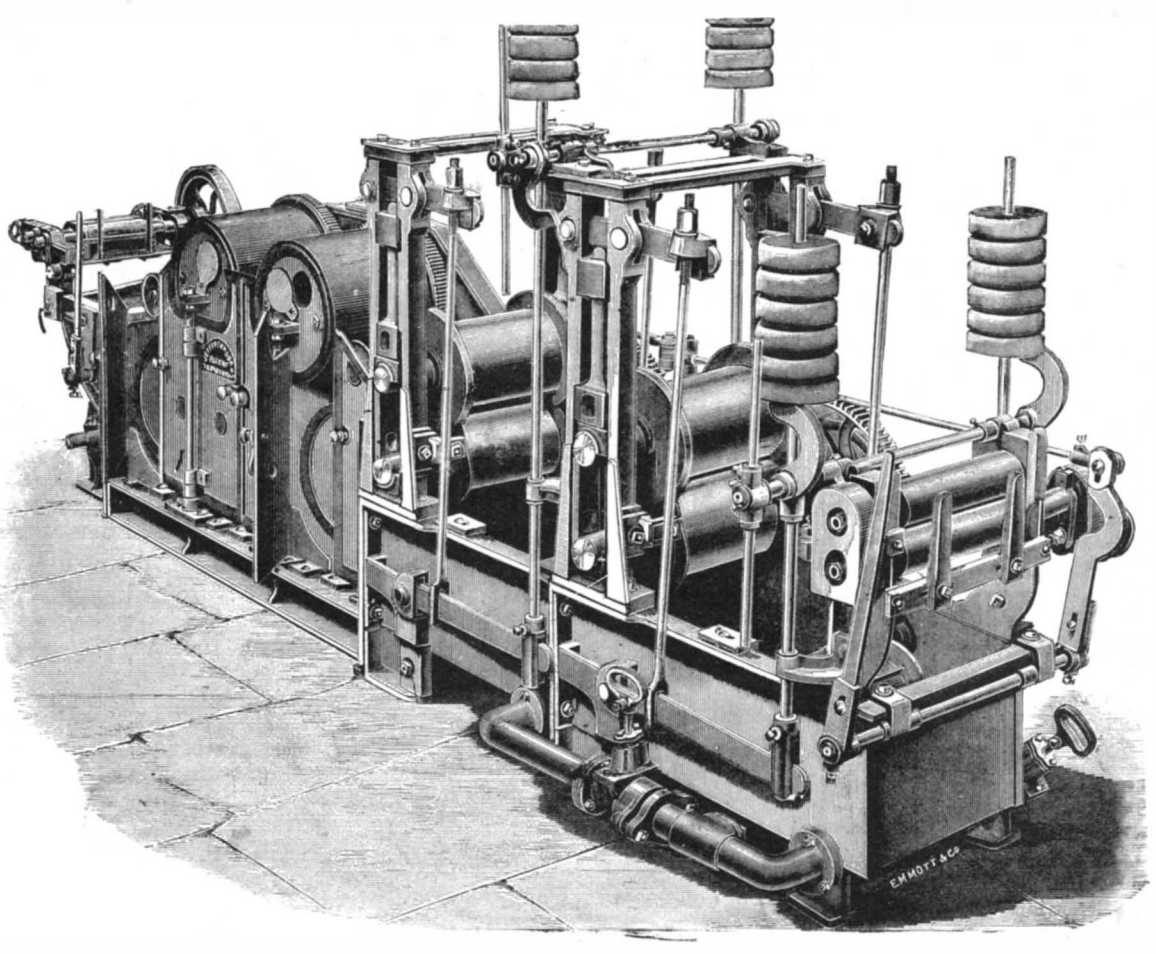
The object of back-washing is to remove the oil that has been introduced into the wool for the carding operation, and the object should be to remove it as effectively as possible. It is maintained by Messrs. Jefferson Brothers, of Bradford, England, makers of the machine here shown, that when worsted coats, etc., wear shiny, it is in a large part due to the oil and grease left in with imperfect washing and back-washing, and they accordingly improve the operation by squeezing four times instead of twice as formerly, viz., they squeeze first with a wet nip, or immersed in the wash liquor, then with a dry nip, then with a wet one, and lastly with a dry nip, after which the slivers pass to the drying cylinders. Says the *Textile Manufacturer*, there can be no mistake about it, but that the theory of the wet nip is the correct one to work upon. It may be well explained by the washing of a lump of wool thoroughly impregnated with dirt or sand. The way we would do this naturally would be to take it, immerse it in the suds, and still keeping it immersed to squeeze and relax it as often as required. This corresponds with the wet nip, the act of squeezing in the presence of plenty of suds or liquor greatly facilitating the removal of dirt. The equivalent for the dry nip is to lift the wool out of the suds, allowing the surplus liquor to flow away, and the material to partly dry, sadden, and cool, and then to squeeze it. Now, when wool partly dries by this means, it becomes more compact, and the dirt it contains is retained by the squeezing, instead of being expelled by the suds.

Another great advantage of having the first dip under the level of the water, as shown in the diagram herewith, is that the slivers are not lifted through the scum and dirt floating on the water in the usual way, and therefore do not carry any with them to the second or the dry nip. The streakiness so often seen when slivers have been back-washed in the common way is thus entirely obviated.

The washing part of the machine has two suds bowls connected by a pipe and injector, so that when the water in the bowl, into which the wool first passes, becomes too dirty for use it is discharged, and the water from the second bowl is then put into it, and a fresh supply of suds is made in the second bowl. Each bowl is fitted with the double squeezing head, that is, the slivers are washed and squeezed once in both bowls, each time with a wet and a dry nip. Of course the number of slivers are, as usual, varied according to requirement, and may be of any kind of material, either of short, medium, or long wool. The wool after leaving the rollers passes on to the drying cylinders, which are arranged in two tiers in order to save length in the machine. In dimensions they are 14 inches wide by 18 inches diameter, and it will be noticed that on one side they are free and open, an improvement which allows of better access to the slivers upon them. The side toward the reader are the free ends; they are, however, covered with hinged doors up to about half the height of the upper cylinders, for the purpose of keeping to the slivers as it passes out the hot air heated as we have already described in the economizers below.

The drying cylinders have a notable improvement in their construction which we thinks deserves adoption in other drying machines. The usual, or old, mode of constructing these is of stout tin plate, sheet iron, or sheet copper, also the cast iron, with stuffing boxes to make the joints steam tight, and buckets inside the cylinders to remove the water due to condensation. This plan gives trouble by leakage at the glands, which are, however, entirely done away with in Messrs. Jefferson's arrangement, which is also enabled to work with much less steam, as the center of the steam jacket is cast hollow, and there is no steam in the center, about one-quarter being in fact in use.

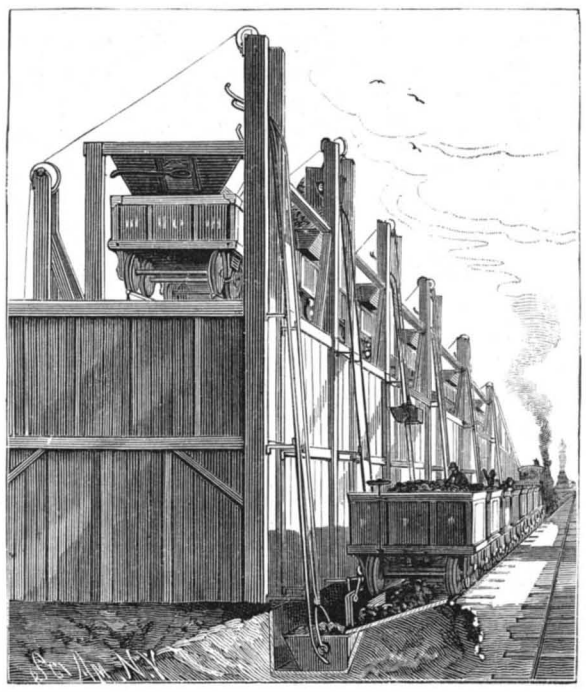
The improvement consists of an annular cast iron casting, or jacket it may be called, fixed to the frame of the machine and fitted with the necessary steam and exhaust or drain pipes. The inside of this casing or jacket is filled with steam which heats the material of which it is composed, and also the revolving cast iron shell or sleeve placed upon it. The slivers are dried by contact with the latter, and also by the heated air from the economizers below. The latter are heated by the exhaust steam; the air is obtained from a fan placed at the back end of the machine near the can motion.



IMPROVED BACK WASHING MACHINE.

UNLOADING AND ELEVATING APPARATUS.

The apparatus is constructed with a chute below a railway track, and beneath which is a pit into which an elevator bucket, running on tracks of a frame, may pass. The material is raised by the bucket, and discharged into a hopper supported on the frame over tracks on which transfer cars run. Fitted at the outer end of the chute, and provided with suitable mechanism by which it may be opened to let the coal or other material fall into the pit, is a gate. Extending upward from the pit are tracks, curving inward at the top to allow the side rollers of the bucket to move inward as it dumps its load into the hopper fixed to the trestle, so that the cars can be run below the hopper to be loaded. The bottom of the hopper inclines toward an outlet closed by a sliding gate. The hoisting rope connected to the bucket passes over a pulley on top of the frame posts, and then to the winding drum. The lower ends of the tracks curve outward, to carry the back of the bucket well underneath the end of the chute.



McNELLY'S UNLOADING AND ELEVATING APPARATUS.

The bucket, having been filled by opening the chute gate, is raised by the rope until it strikes the hook heads of elastic or yielding tripbars secured to the frame posts; continued hoisting of the bucket carries it inward on the curved ends of the tracks, and causes it to tip to discharge its load into the hopper, the trip bars yielding backward to allow the front of the bucket to stand well within the hopper. It will be seen that coal may be quickly removed from the railway cars, and be elevated and transferred to any desired point in the yard below the trestle without hand shoveling.

This invention has been patented by Mr. M. J. McNelly, whose address is care of Messrs. George W. Bush & Sons, of Wilmington, Del.

Ex-Governor Stanford's Educational Projects.

In a recent interview with a reporter, Ex-Governor Stanford, the California millionaire whose only son died in Paris about one year ago, outlined some of his plans for establishing educational institutions at Palo Alto as a monument to the memory of his son. The memorial university will not only afford opportunities for learning to the youths of that State, but will be open to students from all parts of the Union. In addition to the university colleges for young men and women, high schools for boys and girls will be founded, to be attached to them. Mr. Stanford also intends to carry out the wishes of his son, and found an institution almost similar to the Cooper Institute of New York. It will also be used for the advancement of science and art, with evening classes for mechanics and youths. There will be a school of design, a polytechnic school, galleries of art, collections of models, of inventions, etc. Gov. Stanford has been elected United States Senator.

Hints to Inventors.

The long winter evenings are now at hand, and afford an opportunity for those of an inventive turn to put their ideas into practical shape by perfecting devices that they have had in mind, or to cast about for something new on which to exercise their genius. Many laundries have reduced their regular working forces, and ingenious employes, who will be idle for some months, can make good use of their time by studying the wants of the public in the way of improvements in their line, and supplying these wants.—*National Laundry Journal.*

New Ship Canal.

A steamship route between Harwich and Liverpool, for some reason to be called the Ipswich and Birmingham Ship Canal, is the subject of a pamphlet by Mr. Joseph Robinson. "It is estimated that 70,000 men would be required to complete the canal in seven years. The length of this canal would be about 200 miles; the estimated cost, £50,000,000. For the purpose of raising the vessels from one level to another, it is intended that inclined planes should be constructed in place of locks, excepting Ipswich lock, so that the steamships may continue from station to station without stopping, if required, so that the whole length of that canal (200 miles) may be traveled in one day, including such stoppages. It is intended that locomotive engines shall be employed for the purpose of towing the vessels through the canal. For this purpose rails 4 feet 8½ inches gauge are to be laid on each bank of the canal.

The canal will be divided into seven sections, as follows: Section A, or Ipswich district, 35 miles of canal; Section B, Cambridge district, 30 miles; Section C, Bedford district, 30 miles; Section D, Northampton district, 25 miles; Section E, Birmingham district, 25 miles; Section F, Wolverhampton district, 30 miles; Section G, Liverpool and Manchester, 30 miles. Each ship or string of small boats will be towed through each section of the canal in about two hours. A locomotive engine will be attached to the vessel running on the bank of the canal. For example, a vessel arriving at Ipswich from the east, the engine would be attached and the vessel would be towed to Cambridge, thus completing Section A. The locomotive would be uncoupled from the vessel and return to Ipswich, if required, receiving information by telegram where to meet the next vessel—at Ipswich or Cambridge. A second locomotive would tow the vessels on Section B—that is, from Cambridge to Bedford—changing engines in like manner on each section of the canal, allowing the vessels time to take in goods or passengers at each of the seven stations, if required."

Mr. Robinson thinks the government might help by furnishing the Canal Commissioners with 50 millions sterling.

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Composite Portraits.

At the Newport meeting of the National Academy of Sciences, Prof. R. Pumpelly read a paper "On an Experimental Composite Photograph of the Members of the Academy," illustrating it by photographs of several groups of the members, and also by photographs of engineers employed on the northern transcontinental survey.

This paper was in the direction of the experiments first instituted by Francis Galton, and described by him in his book "On the Existence of the Human Faculty." Galton's experiments seemed to indicate the possibility of obtaining type-pictures of different types of different persons and characters.

These pictures are obtained by taking the photographs of a number of different individuals of the type to be compared, in as nearly as possible the same position. These pictures are then photographed on the same negative, being superposed one on the other, and each photograph being exposed for only a very short time, so that the resultant contains and combines all the features which the different photographs possess in common, but eliminates those which are due solely to individual peculiarities. The pictures are focused on the eyes; and since the distance in eye differs in different persons, some indistinctness about the borders of picture is inevitable. The mouth especially appears to lack decision, by reason of being somewhat blurred; yet on the whole the composite picture is such a one as would be at once recognized by most persons as a fair illustration of such a kind of person as the individuals which compose the class under observation.

It is by somewhat such a process as this, in fact, that Prof. Pumpelly thinks that we usually form a mental image of different types and classes, whereby we recognize, for instance, at sight a Chinaman or an Indian.

The pictures of members of the Academy showed in one instance a compound formed from thirty-one individual members. This picture may fairly be taken as a type-picture of the average scientist or the ideal intellectual man of the Caucasian type, being composed as it is of individuals the most eminent in America in various lines of scientific research. It shows, as must have been expected, a high and massive forehead, and that well known though indescribable cast of countenance which we all pronounce at once, without perhaps being able to assign any reason for it, to be intellectual, so that on seeing a countenance of this stamp we naturally infer that it is that of a professional man.

It was observed, however, that the faces of three of the persons thus combined differed largely from the average type, and in the subsequent experiments these three photographs were omitted for the purpose of securing greater clearness in the result, notwithstanding that the exposure of each picture to the camera was only two seconds, out of the total exposure of sixty-two seconds for all, so that the peculiarities of individual pictures would make only a very feeble impression on the combined photograph. The remaining twenty-eight pictures, then, were divided into two groups, and classified, according to the department of science most affected by the members, into sixteen naturalists and twelve mathematicians.

On combining the mathematicians into one group and the naturalists into another, it was seen that, with apparently the same height of forehead, the mathematicians have a broader, and the naturalists a slightly narrower, forehead than the average.

Prof. Pumpelly spoke at some length of Galton's experiments, by which he has obtained type-pictures of burglars and of other classes of criminals, of engineers, of persons suffering under certain form of disease, such as consumption, of family groups, etc.

He intimated that it was his intention to prosecute these inquiries in the direction of composite profiles, which he expected would produce some startling results. He regarded this as a method of much value in anthropological work.

Major Powell stated that the same method had been applied to obtain a composite photograph of crania at Washington, but without success.

Other members of the Academy, however, indorsed Prof. Pumpelly's views.

Prof. Peirce thought it particularly desirable to obtain a composite photograph of musicians, and also of mathematicians who were devoted exclusively to mathematics, remarking that the members of the Academy represented were not of that exclusive mathematical type which he regarded as a very peculiar one.

Uses of a Common Paraffine Taper.

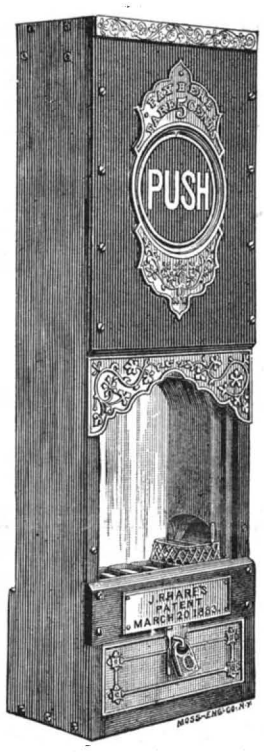
A common white paraffine taper makes, I find, one of the best bougies for exploring the nasal cavity. I use a taper of from one-eighth to one-sixth of an inch in diameter, and about ten inches in length. For mere exploration I round off the end that is to be introduced into the nasal cavity, bend the taper into an easy curve, make it slightly soft by warming it in my hand, and then have it ready for use. The perfect smoothness of the surface of the bougie thus formed, the ease with which it bends, and the just sufficient strength given to it by the wick, are qualities which make this simple, inexpensive, and always ready instrument very effective. From its color it is also readily discernible in the throat when it is passed into the pharynx.

The taper has other uses. If it be wished to apply iodine evenly to the whole of the nasal cavity, the thing can be done at once by means of the taper. It is merely necessary to paint the end of the taper for a couple of inches with iodized colloid or with tincture of iodine, and then introduce it, to secure that all the iodine is left on the mucous lining of the nasal cavity. In ozena, patients can be taught to carry out this method for themselves at stated times. I have two patients now who have done this with the best effect.

The taper admits of another useful application. If the cotton within it be nicely teased out at one end of a short length, the cotton makes one of the most convenient of brushes for applying iodine or other solutions to the throat. In scarlet fever and other affections attended with throat complication, I invariably instruct the nurse or attendant to be provided with a few tapers of different sizes, and to make them act as the brush for applications to the throat; and as soon as one brush has been used, to cut it off with scissors, burn it, and make another. The same kind of brush can be used with equal advantage for cleaning the tube after the operation of tracheotomy.—*Dr. Richardson.*

IMPROVED CAR FARE BOX.

The accompanying illustration shows a novel and useful improvement in car fare boxes. It will be seen that instead of a slit or hole in which to deposit the fare, a door is provided that allows the entire hand to be thrust into the box, the deposit sliding down a funnel-shaped receptacle into the end compartment of an endless chain of boxes. The fender surrounding the first division prevents the money from jumping over into the adjoining box. Each successive deposit moves the belt one space, and dumps one fare into the box below; the deposits are kept separated, and at all times the last five are visible. A bell on the outside of the box notifies the driver of each deposit. No lamp is required for this box, as a small reflector is so arranged as to throw the rays from the headlight down into the interior. The apparatus takes up no room, outside or inside, being flush with the sides of the door frame. The driver, being relieved of the trouble of watching and dumping the fares, can give more attention to the picking up of passengers, etc. It is impossible to rob the box with waxed strings or like devices, as upon opening the door for that purpose the fare passes out of reach, and only an empty compartment is presented.



This invention has been patented by Mr. J. R. Hare, of 63 W. Fayette Street, Baltimore, Md., who will furnish further particulars.

Darkening Oak.

To render new oak wainscoting and oak furniture dark, and give it an antique appearance, we have it from good authority that ammonia is the cleanest, best, and cheapest material that can be used. The liquid stains commonly used are apt to raise the grain of the wood, make it rough, and it is with difficulty evenly applied, whereas in the use of ammonia it is simply the fumes that color the wood, and do it so completely that it is difficult to tell whether the wood is really new or old.

A correspondent in the *English Mechanic* gives the following process of treatment, which he considers the best, after trying the various other processes used by builders and cabinetmakers to darken woods: "Oak is fumigated by liquid ammonia, strength 880°, which may be bought at any wholesale chemist's at 5s. a gallon. The wood should be placed in a *dark* and *airtight* room (in a big packing case, if you like!), and half a pint or so of ammonia poured into a soup plate, and placed upon the *ground* in the center of the compartment. This done, shut the entrance, and secure any cracks, if any, by pasted slips of paper. Remember that the ammonia does not touch the oak, but the gas that comes from it acts in a wondrous manner upon the tannic acid in that wood, and browns it so deeply that a shaving or two may actually be taken off without removing the color. The depth of shade will entirely depend upon the quantity of ammonia used and the time the wood is exposed. Try an odd bit first experimentally, and then use your own judgment."

A Large Price for a Bible.

A Bible was sold at auction in London the other day for three thousand nine hundred pounds sterling (about $19,500). It was knocked down, after spirited bidding by a number of contestants for the book, to Mr. Quaritch, a dealer in rare works, and is believed to be the highest price ever paid for a single copy of any book at auction. It is known to bibliophilists as the Mazarin Bible.

The title is derived from the fact of a copy having been discovered in the library of Cardinal Mazarin in Paris, about the middle of the eighteenth century, and it is generally assumed to have been the earliest printed book. There are said to be eighteen of this edition in existence, one-half of which are in public libraries in Europe.

The copy for which Mr. Quaritch bid such a wonderful price is described in the *Art Age* as "magnificent." It is printed in double columns in type similar to Church script, and is "splendidly" bound in blue morocco. The Mazarin Bible is without date, and is variously ascribed to the years 1450, 1452, and 1455. A copy preserved in what used to be called the Royal Library at Paris contains a note stating that it was completed "in binding and illuminating" in the year 1456, which would put the probable date of printing at twelve months earlier. According to the catalogue of the Syston Park Library, the Mazarin Bible is printed with metal types. Typefounders, however, have differed on that point among themselves, some contending that it was compressed from wooden blocks, others declaring for letters cut in metal, and a third party deciding in favor of cast letters, the last in every material respect like those now in use. But, whatever kind of type may have been employed in producing the earliest printed book, it would, even at the present time, be accepted as a noble specimen of the typographic art.

The printing of the Mazarin Bible is ascribed to Gutenberg, but the fact, we believe, has never been established beyond a doubt. Mr. Quaritch, in an interview with a newspaper reporter after the sale, said that three out of the five copies of this edition of the Bible known to be owned by private parties had passed through his hands, the first being purchased by him when a young man for £590. "The present copy," Mr. Quaritch went on to say, "I have also bought for my stock, and it is purely a speculation of my own. I do not expect to keep it long."

Nova Scotia Heard From.

The Yarmouth (N. S.) *Times* thus discourses on the merits of the publications issued from this office:

"We have received the SCIENTIFIC AMERICAN Hand Book for 1885. It is a beautifully gotten up little book, filled with most valuable information for inventors and others seeking information about patents and the course to pursue in securing or renewing patents. The SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT are certainly the best papers of the kind published on the continent, and take a front rank throughout the whole world. The student of scientific subjects and all kinds of mechanics will find the paper invaluable. Inventors and those interested in the wonderful inventions which are daily brought before the world can find no better way of keeping themselves informed than by reading these papers. The articles are all written in such a way that all can understand them, and no better engravings of the kind are made than those illustrating these articles. In a growing manufacturing community like Yarmouth such periodicals should be in the hands of every one, and the prices of subscription are so low as to be within the means of the poorest."

We are waiting to hear further from Yarmouth.—ED.

Medical Advice by Telephone, as Related in One of our Medical Journals.

Husband—My wife has a severe pain in the back of her neck, and complains of a sort of sourness in the stomach.

Physician—She has malarial colic.

Husband—What shall I do for her?

[The girl at the "central" switches off to a machinist talking to a sawmill man.]

Machinist to Husband—I think she is covered with scales inside, about an inch thick. Let her cool down during the night, and before she fires up in the morning, take a hammer and pound her thoroughly all over, and then take a hose and hitch it to the fire plug, and wash her out.

Husband has no further need of this doctor.

Danger in the Water Trough.

The *British Medical Journal* suggests a danger to horses at public drinking troughs. It believes that glanders are spread among horses in this way, and recommends a stand pipe and bucket as the safest and best arrangement for watering animals in cities. It is more comfortable for the horse, who has not to strain his neck against the collar to reach the water, the water is fresher and more palatable, and there is far less danger of its being contaminated with dust, dirt, and the germs of disease.

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Correspondence.

Communication with Vessels at Sea.

To the Editor of the Scientific American:

The frequent failure of transatlantic steamers to reach their ports on time, owing to some accident to their machinery, and consequent anxiety of the public, has, in connection with other considerations of perhaps greater importance, made it seem to me that before many years the demand for some means of communicating with vessels on the ocean would become imperative.

The recent accomplishment of this object in reference to a train of cars in full motion at first sight seems to point out the direction in which inventors should work. But the two cases are so different that little can be hoped for in that line until, at least, our knowledge of electricity is much extended.

There seems to me to be one way of accomplishing the desired object, though not so completely as one could wish. This is to establish a line of stations in the path of European vessels, connected with each other and with the continents by telegraph cables.

The average time of our fast passenger steamers is not far from eight days between New York and English ports.

Now, suppose that seven vessels, constructed in a peculiar manner mentioned below, be anchored at distances of one day's sail from each other in the path of these steamers, and it will be apparent that there is at hand a ready means for seafaring persons to send messages to friends, and inform them of any accident that may delay their entry into port, and in return receive the news of the world at each station. That this would be a great convenience, especially to business men, no one will doubt.

The chief difficulty would be in anchoring the station ship firmly to the bottom, to resist the driving force of the winds.

Their effect, however, might be much lessened by constructing the ship in the shape of a bottle or chemist's flask, having only the neck above water. The wind would then have only a small surface to act upon, and the inertia of the great mass below, immersed in the water, would secure the anchor cables against sudden shocks due to squalls.

These cables would extend, on three or four sides of the ship, out for several miles, and have immense anchors attached. The motion imparted to the ship by the waves would be slight compared with the great length of the cables, and the sags in the latter would easily admit of any such motion, even in violent storms.

This flask shape would be the best for strength, and the great surface of the ship would be removed from the beating action of the waves. A tall mast might be erected on top, and carry an electric light to show its position to passing vessels at night.

In good weather, ships could send a boat to the station for mail, and by lying to for an hour, or waiting until the next station was reached, send answers to the land. When too stormy to lower a boat, signals could be exchanged, and persons on shore informed of the whereabouts of the vessel.

In case of a ship being burnt at sea or sunk by an iceberg, what a harbor of refuge these stations would be to the survivors!

Four or five men would be required at the station, and several vessels would stop during each day, so that it would not be as lonesome as or more dangerous than some of our lighthouses.

This system of stations would also add greatly to the efficiency of the Signal Service. C. G. R.

New Haven, Conn., Feb. 9, 1885.

Crowded London.

At a recent meeting of the London City Commission of Sewers at Guildhall, Mr. H. H. Bridgman presented a scheme, of which he submitted a plan and map, contemplating the erection in the center of the roadway between the Mansion House and the Bank of a circular chamber about 20 feet in diameter with an 8 foot skylight at the top. Around this he would place, on the surface, a pavement 6 feet wide, which would be an effective refuge for foot passengers who preferred to cross above ground. Under the surface the plan was to construct four radiating subways from the center to the Union Bank at the corner of Princes Street, to the northeast corner of the Mansion House, to the open space in front of the Royal Exchange, and to the Liverpool and London and Globe Insurance office at the corner of Lombard Street and Cornhill.

The subways would be lined with glazed white bricks from end to end, the central chamber and the staircases would be lighted with the electric light, and the subways would be watched and guarded during the day and closed at night. It had been urged that bridges across the thoroughfares would be more useful than underground ways, but he contended that they would create more obstruction and occasion more danger than they would obviate. As to the necessity for such an improvement, let them consider the enormous pedestrian and vehicular traffic passing the spot daily. The traffic had now increased 29 per cent or 30 per cent since 1860, and it was computed that 70,000 persons now crossed the street in nine hours of the day, and 108,000 in the twenty-four hours, or at the rate of over 34 millions a year. These people had now either to thread their way among horses and vehicles at great danger to life and limb, or the vehicular traffic had to stop every few minutes to allow them to pass. In regard to the vehicular traffic, it was stated that at that particular spot vehicles passed in sixteen different directions at the rate of 54,000 a day, or 17 millions a year; and it was still increasing.

Bird Life in Florida.

Reader, I am going to take you with me to-day, into the woods and swamps, to try and give you a glimpse of the bird life that may be found within a short distance of Palatka. Taking a rowboat, we start early, that we may arrive at a little creek some distance up river by daylight. As it is yet dark, night birds are still holding their fetes in the woods, and from every direction comes the "hoo-hoo-ho-hooa" of the barred owl, with which the swamps are filled, while occasionally the low, mournful note of the screech owl reaches our ears, mingled with the cry of the whippoorwill. At length we reach the creek, just as the first rays of dawn begin to pierce the cloud of blackness that surrounds us; here we come upon a great blue heron, who has been feeding among the lily pads that fringe the mouth. For a moment he stands and gazes at us in mute surprise, as if to inquire what right we have to thus disturb his meal; then, as if suddenly remembering that we probably have some of those things that make a big noise and usually prove disastrous to creatures of his class, he springs into the air, takes a reef in his long neck, and floats lazily away to some more remote spot, where he can finish his breakfast in peace. Entering the mouth of the creek, the first sound that attracts our attention is the note of the yellow-bellied woodpecker. Let us see if we cannot find him, and see what he is at, down in this part of the world; at last we discover him clinging to the side of a large water oak, and busily engaged in devouring the insects which its trunk affords; occasionally he pauses and gives utterance to his queer whining notes, best represented by the syllables, "che-che-e-cheo-cheu." But while we are watching this bird, which we have met so often at the North, a strange note suddenly reaches our ears. Leaving the bird with which we are so well acquainted, we start in the direction of the noise; suddenly it stops, and all is still; with abated breath we wait for it to be repeated, for I think I recognize it; all at once it commences again. Listen! it sounds much like a pileated woodpecker, but much stronger and louder; yes, it is he, the matchless ivory billed woodpecker.

Landing, we cautiously approach, now dodging behind this tree, now under cover of that, but all in vain; he has discovered us, and is off for parts unknown, and as he leaves he utters a wild cry, that bids defiance to all pursuers. The next bird to attract our notice is the Florida darter. What a queer bird he is. How awkward and ungainly he looks as he sits on that stump, twisting his neck into a dozen different shapes as he gazes at us, and tries to determine in which direction he shall fly! The nearer we approach, the more frantic become his efforts to twist his neck off, until suddenly, on our coming too close, he slides off the stump into the air, and flies for some distance up the creek. Notice the manner in which he flies—in much the same manner as a hawk—with quick strokes of his wings, and then sailing a short distance; his neck he carries straight out in front after the fashion of ducks. See how he flops his wings and pokes his head about in his endeavors to alight on the limb of that tree that projects over the water. After several unsuccessful efforts, he at length secures his balance, and then turns his head to see if we are following him. As we again draw near, he concludes that we are getting too familiar, and flies into the air high above the trees, and for a few minutes sweeps around in broad circles much like a hawk, only beating his wings briskly all the time; soon he comes down, and flies straight toward us about ten yards above the water, and in attempting to pass over our heads he offers such a splendid chance, and is in such good plumage, that I cannot help grasping my gun and giving him the contents of one barrel, which proves successful in pacifying him, and we bring him in to prepare for the cabinet at home. As we round a curve in the stream, we come upon dozens of turkey buzzards perched in the trees; and on the ground beneath them the putrid carcass of some animal that has probably drifted in here with the tide, covered with these birds, who are busily engaged in devouring it, and gloating over the rich feast they have found. As soon as one has eaten all he can possibly hold, he flies laboriously to a tree; or if too gorged to fly, makes his way to some fallen tree or upturned root, and there, if he is not disturbed, he will sit until what he has eaten is digested, and then fly back after more, as hungry as ever. As we have watched them some time, let us pass slowly on. Presently a large flock of bluebirds fly overhead; now they are sweeping about in wide circles, and constantly calling to each other; now they are all perched amid the branches of some tall tree. After watching them repeat these maneuvers several times, we come to the conclusion that they are gathering in flocks preparatory to leaving for the North. No sooner, however, have we left these birds than a larger flock of American goldfinches wing their way over, closely followed by a flock of robins, and these in turn by a number of purple grakles, who are chattering to each other about the long journey that is before them.

All at once the scream of the sparrow hawk is heard, and instantly the conversation ceases between all parties. Those who are flying about in the air seek the shelter of the branches, while those already there huddle together and remain motionless until the marauder has passed. Ah! there is our friend the crow. Listen well to his harsh notes, for it may be a long time before you will hear him again, as he is *very* scarce here. The red-cockaded woodpecker is here in large numbers, as is also the golden wing, but the first far outnumbers the second, though we are constantly meeting with them. We are now up among the pines, so let us land, and see what they will afford us. Hearing a confused twittering in the top of a tall pine tree, we look up, and see a number of little forms hopping about and pecking at the cones. After firing several ineffectual shots, one is at last hit, and comes tumbling down through the branches; picking him up, we find him to be a handsome male specimen of the brown-headed or pygmy nuthatch. Of course, on discovering this, several more have to be procured, until seven in all lie side by side to prove the accuracy of our aim. The scrub is also full of many small birds, and among others we recognize the Maryland yellow throat, varied pine creeping, and black throated blue warblers. Seeing one species that we do not recognize, we resort again to the gun, and find it to be the yellow red-poll warbler, quite rare at the North, so we procure several specimens. Suddenly the air around us is filled with the whir of rapidly beating wings, and a covey of quail (*Ortyx virginianus*) that we have stumbled upon, goes speeding away over the tops of the bushes. Bang! bang! bang! bang! and three birds fall to satisfy our craving thirst for blood. Enough to make a lunch on, at any rate; so, as it is past the hour of noon, we kindle a fire, roast our birds, and proceed to make a meal on food that is fit for a king. While eating, a fine speciman of a red-tailed hawk alights in a tree a short distance off; dropping everything, I seize my gun, and, after carefully dodging from tree to tree, at length reach a place near enough to fire, and—slay one more specimen for the cause of science.

On entering the scrub after finishing our meal, we surprise a flock of cardinal grossbeaks, and succeed in securing a number of fine specimens. At this season they are not in song, but instead a "chip," uttered in much the same tone as that of a bay-winged bunting. One species of woodpecker we find to be as common here as the downy is at the North—the red-bellied. We cannot go into the pines or swamps without hearing dozens of them; their note is best represented by the syllables "chip-chip, chip-chip," uttered in a harsh, guttural tone, and repeated every few moments. The mocking bird is also to be met with in the swamps; but he is less numerous here than in the town, where he is very common, and tame. On our way down the creek we see several specimens of the hermit thrush, and one of the brown thrush, or thrasher. In a bush that stands on the bank we discover two catbirds hard at work engaged in devouring the berries with which it is loaded, and occasionally uttering their plaintive note. Passing out into the river, we discover a flock of bluebills, and out of it manage to secure three handsome specimens, two males and one female. We arrive home just after dark, and on counting up the spoils find that, besides the many valuable notes we have made, we have lying before us the following birds: Seven brown-headed nuthatches; five yellow red polls, six cardinal grossbeaks, one red-tailed hawk, one darter, and three bluebills.

Yes, we are tired, but are more than satisfied with the day spent among the birds.

E. M. HASBROUCK.

Palatka, Fla.

Railway Stops.

The London and Brighton Railway Company (England) lately accurately ascertained the daily number of stoppages made by its trains. Out of a total of 17,000 stops in 24 hours, only 10,000 were regular station stops, the remaining 7,000 being irregular stops between stations, waiting for the line clear signals, etc. The traffic on this line is chiefly suburban and local passenger, and the loss of time and money on 7,000 extra stops per diem must amount to a large figure. Reckoning each stop at only 3 minutes, the loss amounts to 350 hours per day, and taking the wages of a crew working a train at 1s. 9d. per hour, or 42 cents, the annual loss due to this item alone amounts to nearly $50,000 per annum—rather a large sum to pay for the privilege of having more traffic than can be handled conveniently. This line is worked on the block system throughout.

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TORPEDOES OF THE AUSTRIAN NAVY.

At the time of the last Austro-Italian war, in 1866, the Austrian Government made the greatest efforts to put its ports in a state of defense against an attack of the Italian fleet. Torpedoes in large numbers were sunk therein, and all the commandants of these maritime places were ordered to exercise very great vigilance.

The accompanying engraving represents the post of observation, or of firing, where the employes of the military telegraph are stationed.

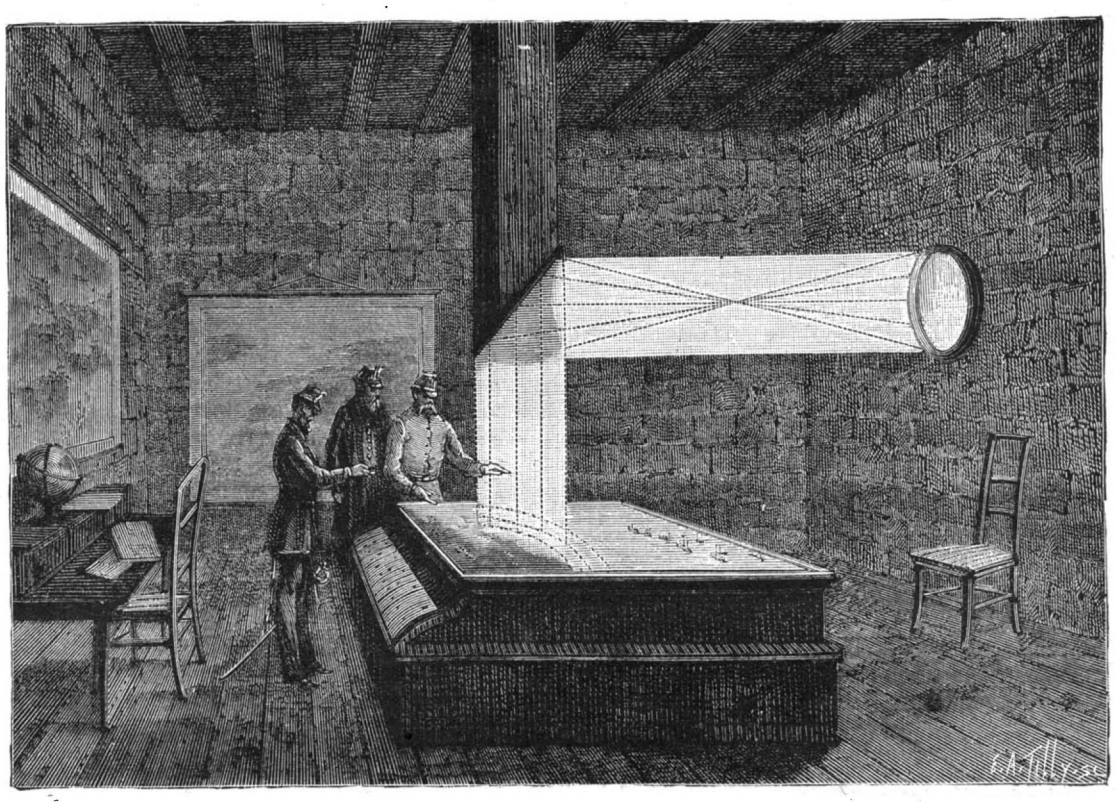
The torpedoes are placed in several concentric lines, quite near each other. They are sunk to a certain depth below the level of the water, and, at the surface, give no signs of their presence. Each of them is connected by wire with the post of observation situated at a sufficiently high point on the coast to allow the port to be seen well. The room, which is quite large, is dark. In the wall there is a lens that faces the port. The luminous rays from the exterior traverse this, become refracted, and pass into a prism, which directs them upon a sheet of ground glass lying horizontally upon a table in the center of the room.

According to the well known laws of optics, an image of the port is formed upon the glass. Black points marked upon this image indicate the exact site of each torpedo, and all these points bear numbers that are reproduced upon the keys of a key board. It is only necessary to press one of the keys with the finger to put the corresponding torpedo in connection with an electric battery, through the intermedium of the wire that connects it with the port, and to cause it to explode.

One employe of the telegraph never takes his eyes off the glass upon which the faithful image of the port is reproduced. No detail, no movement, escapes him. If a ship of the enemy attempts to approach, its image appears upon the glass, and, at the moment it passes over a point indicated upon the latter, a simple touch of the key corresponding thereto causes an explosion, and destroys the vessel.

These torpedoes are sunk to a sufficient depth to allow ships of the port to move around without having anything to fear. It is probable that it was due to a knowledge of the danger that the Italian fleet would have experienced in attacking the Austrian ports, that the latter were protected against all surprise.

Arrangements analogous to those just described are now adopted by most of the navies of Europe.—*La Nature.*



POST OF OBSERVATION CONNECTED WITH THE AUSTRIAN SYSTEM OF TORPEDO DEFENSE.

AN EARLY ELECTRO-MAGNETIC LOCOMOTIVE.

In the interesting account of electro-motors contained in a letter of Prof. Moses G. Farmer to C. W. Field, and published in the SCIENTIFIC AMERICAN SUPPLEMENT of January 17, there is a description of a small electro-magnetic locomotive, constructed in 1851 by Thomas Hall, of Boston, and which operated by an electric current conveyed by the rails, probably the first instance of an electro-locomotor deriving its actuating current from a stationary electric generator. This engine, with a part of its track, is represented in the accompanying cuts; it is owned by E. Dwight Kendall, consulting chemist, of Brooklyn, who purchased it, soon after it was made, of Daniel Davis, Mr. Hall's former employer. Prof. Kendall, who was at that time, as now, a valued contributor to the SCIENTIFIC AMERICAN, occasionally used it in his lectures to illustrate electro-magnetic force.

The current of a battery or small dynamo electric machine is conveyed to the rails, the connections being made as shown in Fig. 1. The rear axle, M (Fig. 2 being an inverted plan view of the locomotive), consists of a central wooden portion which is slotted to receive a standard projecting from a brass plate screwed to the bottom of the car. A bar connects the pivot pin with the shaft carrying the wheel, K, which takes up the current from the rail; the other wheel, being insulated by the wooden portion, has no effect upon the current using the rail it runs upon. Both these wheels are loosely mounted. The current is led from the wheel, K, through pivot, brass standard, and wire, to brass plate, G. The front wheels are rigidly mounted upon an axle, at the center of which is secured a gear wheel. One wheel is insulated from the axle by means of an ivory sleeve, L. The current passes from the rail through the wheel, J, through the axle bearing and wire to a standard provided with a collar formed with an arm to which the lever, A, is fastened. This lever is insulated from the collar arm by a block of wood. Soldered to the rear end of the lever is a wire, one section, D, being always in contact with the plate, G, and the other section, B, being turned and passed under the lever so as to rest in contact with plate, E, which is one of a pair on the bottom of the car at each side of the standard. A wire, C, from the collar is in contact with plate, F. By means of the lever the pieces, B and C, can be brought in contact with either of the plates, E and F. From the free end of the lever a short bar projects downward, so as to be struck and moved to one side or the other by the blocks, H I, which are placed, one at each end of the track, at such an inclination as to move the lever sufficiently to change the plates with which the points, B and C, come in contact.

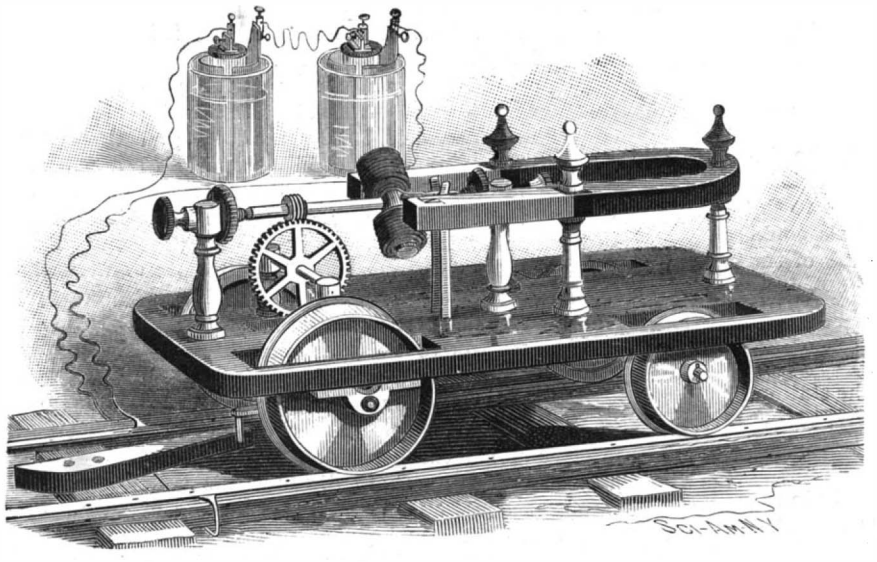


Fig. 1.—ELECTRO-MAGNETIC LOCOMOTIVE.

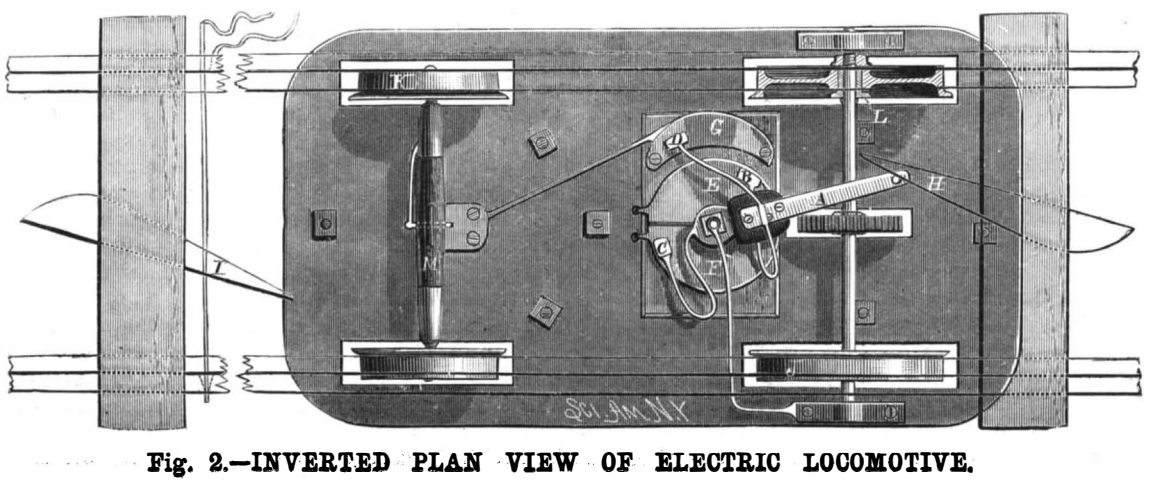


Fig. 2.—INVERTED PLAN VIEW OF ELECTRIC LOCOMOTIVE.

Mounted longitudinally upon the top of the platform is a shaft carrying an electro-magnet, revolving between the poles of a horseshoe magnet, and a worm which meshes with a gear wheel engaging with the wheel on the forward axle. The wires from the magnet lead to two semi-cylindrical pieces at the rear end of the shaft, against which press two springs connected respectively with the plates, E and F. The path the current travels, when the lever is in either of its two positions, to revolve the magnet first in one direction, then in the other, will be understood from what we have said and from the engravings. With the current from two or three Grove or chromic acid cells, the little locomotive exhibits great earnestness of purpose, and runs with respectable speed.

Ancient Chinese Telephones.

At a recent meeting of the Royal Asiatic Society in Shanghai, a paper by Dr. Macgowan was read on the subject of the early use of telephones in China. This paper being very brief, we give it in its entirety:

It detracts nothing from the merit of the ingenious physicists who have conferred on mankind the boon of the telephone, that its principles are familiar to uncivilized peoples, several of whom are in possession of rudimentary telephones. It was, I opine, when the Chinese were in their youth that they constructed the rudimentary instrument a specimen of which I herewith transmit for the Society's museum. It consists of two bamboo cylinders, one and a half to two inches in diameter, and four in length; one end of each is closed by a tympanum of pig bladder, which is perforated for the transmitting string, the string kept in place by being knotted. This rude instrument is styled the "listening tubes," and is employed for amusement as a toy, conveying whispers forty or fifty feet. It is unknown in many parts of the empire, Chih-kiang and Kiangsu being the only provinces (so far as I can ascertain) where the listening tube is employed.

Besides this toy, Chinese ingenuity produced, about a century and a half ago, the "thousand mile speaker." The implement is described as "a roll of copper, likened to a fife, containing an artful device; whispered into and immediately closed, the confined message, however long, may be conveyed to any distance; and thus in a battle secret instructions may be conveniently communicated. It is a contrivance of extraordinary merit." The inventor of the "thousand mile speaker," Chiang Shun-hsin, of Huichou, flourished during the reign of Kang-hsi, A. D. 1662–1772. He wrote on occult science, astronomy, etc. The above account of his invention was taken from his works by the author of a Fuhkien Miscellany. At that time—reign of Kien Lung—there was no longer an instrument of this description in that province. It seems to have perished with the ingenious scientist who contrived it.

Here is a fine opportunity for the organization of a new telephone company, with a legal department to hunt up the lost evidence, and take a whack at the Bell telephone monopoly. Doubtless many heathen Chinee might be found glad to testify they had often used the old telephone in talking from the Great Wall to Pekin, and further if necessary.

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FISHWAYS ON THE RIVER SIRE.

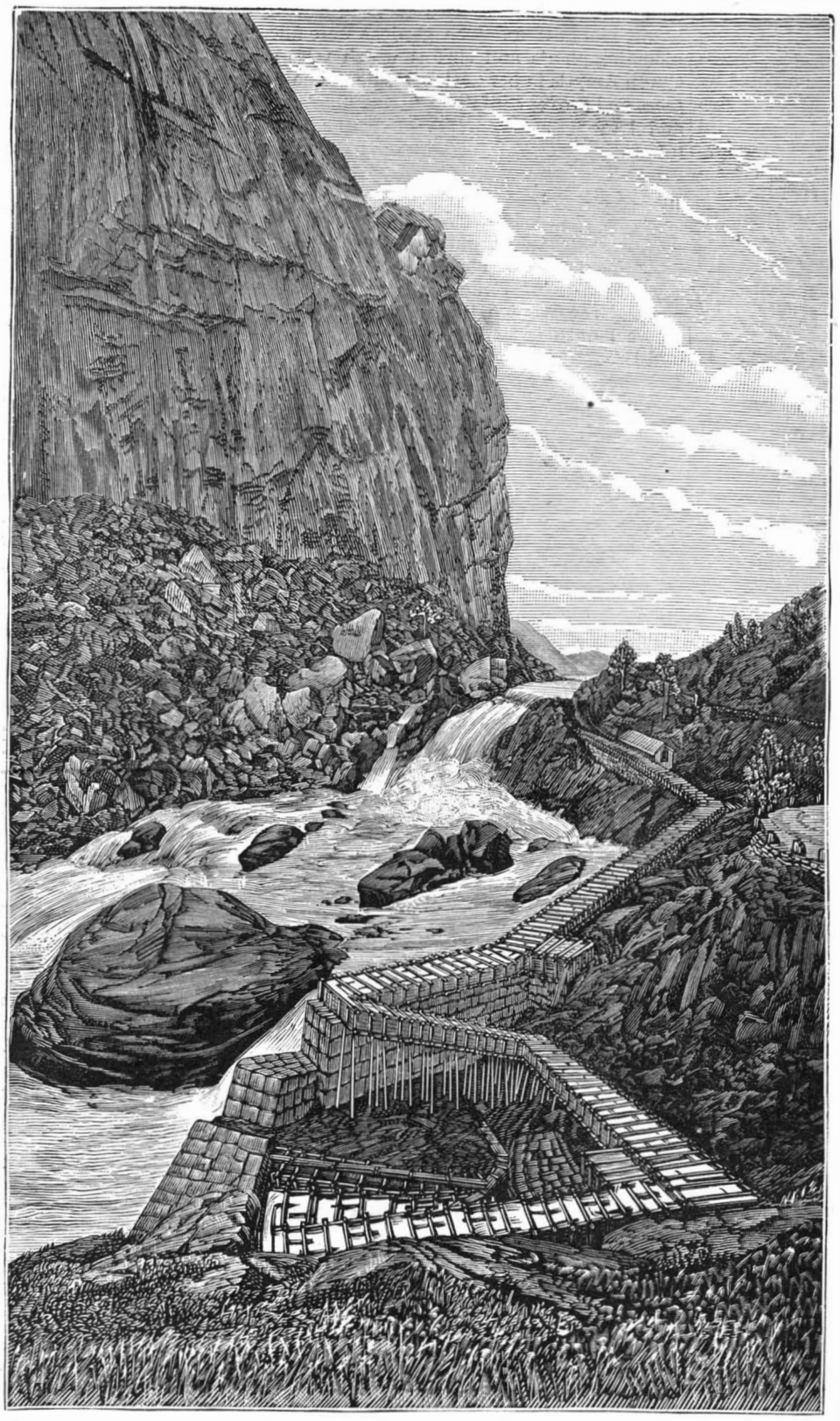
BY A. LANDMARK, GOVERNMENT INSPECTOR OF FISHERIES, NORWAY.

The salmon fishways at Sire, Norway, have attracted considerable attention in the last few years, being the greatest undertaking of this description ever completed in the world. We accompany this article with an illustration of the larger and more complicated of the two fishways of which we are to speak—the one at the so-called Rukanfos, or upper Logsfos.

It is commonly believed that the main object of salmon fishways is to enable the greatest possible number of persons to share the profits of the salmon fisheries, by affording the owners whose property is situated above the obstacles to be overcome by the fishway an opportunity to participate in the salmon fishery. This belief, however, is far from being correct. If in building fishways this was the only object, it would not only be an unnecessary waste of time and money, but simply an injustice to the present owners of the salmon fisheries, as their legally attained rights, self-evidently, would suffer, when being compelled to share them with others. The true object in building salmon fishways is, much more, to increase the salmon by improving the conditions on which the reproduction of the fish is dependent. The salmon can only increase in rivers, where it can spawn late in the fall or early in the winter, in places where the river bottom is made up of fine gravel and where there is an even, somewhat swift, but not violent current. In many salmon rivers, places of this description are rare, especially near the mouth of the river, where the bottom usually consists of clay, mud, or fine sand, and the water is impure. When the salmon is confined to short stretches of river of this nature, it is forced to spawn in places which, if not altogether injurious to the development of the fry, are, at all events, in great measure unfavorable, and the inevitable result is that disproportionately great quantities of spawn are destroyed. Good fishways, then, constructed in the proper places, will greatly improve the productiveness of a salmon river by augmenting the number of favorable spawning places.

The great results attained in this manner can be seen in other countries. In the Ballisodare River, on the northwestern coast of Ireland, where formerly no salmon was found, on account of an insurmountable waterfall at the very mouth of the river, they have succeeded, by using three fishways, in establishing a salmon fishery, valued at 50,000 kroner a year, considerably more than the value of salmon fishing in any Norwegian river. By far greater profits have been realized in other rivers of Great Britain and Ireland by building fishways and demolishing mill dams.

The fishway at the Rukanfos, represented in our engraving, surpasses every work of its kind, both on account of the fall and the obstacles to be overcome. The total height of the fall is, as stated, no less than 27·2 meters (89 feet), and the steep, wild cliffs that surround it on all sides leave but little space for building a fishway. Further, the floods which occasionally occur are exceedingly violent, often causing the water to rise 6·6 meters (21·6 feet) both at the foot and the head of the fall. Extraordinary measures have been necessary in order to procure the necessary room to protect the works against the flood and make them useful at low water. The engraving gives a general view of the work, at the same time conveying an idea of the huge, very nearly perpendicular, mountain side that towers above the fall at its left. It will be seen how the lower part of the fishway is guarded by two immense stone walls, and, partly resting on one of them, winds up through the narrow ravine, until reaching a point from which it is continued in a more horizontal direction. The fishway, which is built of wood, except at the very top, where it is blasted into the stone, has a grade of 1 in 7 and 1 in 8, and is principally arranged according to an American system (E. A. Brackett's), with a few minor alterations. The total length of this fishway is 285 meters (935 feet), while the passage to be made by the salmon is 785 meters (about one-half mile); it is 2·82 meters in width, with a depth of 1·18 meters, depth of water about one meter. The punctuated cross lines in the outline show the current breakers, fixed in the bottom of the channel to check the swiftness of the current. The greatest peculiarity about the fishway is the construction of the lowest part, nearest to the mouth of the channel. To make the fishway more attractive to the salmon, a side channel, which lies nearly horizontally on top of the lower part of the way, has been constructed to increase the water; to keep the water from overflowing during a flood the walls are made considerably higher at the mouth, where they are no no less than 4·2 meters high. The upper course has also some peculiarities of its own, consisting of a number of cross dams, whose level is 0·4 meter lower than those opposite, and in each there is an opening at the bottom 0·89 meter square. The principal dam at the top is fitted out with a trap door which can be opened and closed at pleasure. It has been seen that the salmon can now pass the fishway without any difficulty, notwithstanding that some improvements, to make the fishway more useful at very low water, still remain uncompleted. As the number of salmon in this river, owing to the lack of spawing places which are accessible to the salmon, was small when the fishways were constructed, some years must pass before the results of the labor can be seen. Only few salmon have so far passed up the fishway. When the remaining improvements have been completed, the undertaking will undoubtedly pay largely. At the upper part of the fishway a house for the artificial hatching of salmon has been constructed. We are indebted to the Fish Commission of State of Massachusetts for the loan of the cut.



FISHWAYS ON THE RIVER SIRE.

A CAMEL will work seven or eight days without drinking. In this he differs from some men, who drink seven or eight days without working.

Converting Sawdust into Manure.

A correspondent in the *Country Gentleman* states the chemical process sawdust should undergo to render it suitable for fertilizing, and how to use it on the land after the sweating process has been accomplished. Sawdust is a conductor of heat; to change its condition, heat, air, and moisture are necessary.

To secure the vegetable mould so important in rendering a soil (sand and clay) fertile, sawdust presents a desirable compound for the purpose when properly treated. The difference between humus, ulmine, vegetable mould, etc., consists in their containing more carbon than wood. To obtain these compounds, a slow burning or decay (*eremacausis*) must take place. To produce this chemical action, heat is necessary—at least 80° to 90° Fah., with a small supply of air—a kind of smouldering process. The first element of the wood to unite with oxygen is the hydrogen, and quickly the excess of carbon shows itself by the dark or charcoal color, as is the case when the decay takes place in the soil; as the oxidation of the hydrogen continues, the humus, ulmine, vegetable mould, comes in view. Too much heat must be avoided, or the carbon will also take oxygen, and all will pass to the air as carbonic acid and water, and nothing but the mineral matter be left.

In all manure piles this heat must be controlled, or you will have the so-called fire-fanged mass, free of humus and its allied combinations.

Vegetable matters in a green state possess a self-destructive power within themselves, having the gluten and chlorophyl in a moist state. These compounds are much more sensitive than ternary ones. I will compare them to flesh and fat in the animal kingdom. The carbon, hydrogen, and oxygen of the fat will hold together for a while, but with flesh the case is different. Four [illegible] not company, and they hate each other, *i. e.*, have no chemical affinity. The restless negative nitrogen will slip away the moment the cohesive power of life is lost; hence the rapid resolution of flesh in the presence of that all-important heat.

With this explanation, I purpose suggesting a plan for utilizing sawdust or any carbonaceous matter to reduce to humus. First have a bed of the dust, and on this a thin bed of green matter—weeds of any kind will answer the purpose—then a thin sprinkle of fine road dust of clay, followed by a bed of sawdust, and alternate, until your pile reaches some feet. Soon the unfixed nitrogen will unite with the hydrogen, and seek its old home in the air in the form of ammonia, which, when freed, will be trapped by the clay. The resolution of this vegetable matter sets free the locked up sun-heat it contained, and the heat induces the hydrogen of the wood to seize oxygen and pass to its old condition (water), and the desired combination of humus and vegetable mould comes in full view; and this is the great restorer of life to a worn out body of sand and clay. When applied from a pile of sawdust, or the turning under of a growth of vegetable matter, the result is the same. Life and motion commence, ammonia, carbonic acid, and moisture from the air are all drawn to it and held, and the roots soon find and transform water, carbonic acid, and ammonia into living organic matter, and life again comes out of the inorganic kingdom without the use of flesh and blood.

The First Patent.

The first patent granted to an inventor in the United States is mentioned in a speech of Ex-Senator Wadleigh, of New Hampshire, in the Forty-fifth Congress. The Senator said: "An intelligent gentleman of my own State has referred me to an act of the general court of Massachusetts Bay passed in 1646, granting to one of his ancestors, Joseph Jenks, the exclusive right of making and selling his improved scythe for the term of fourteen years. That, I think, was the first patent granted to an inventor in America. The improvement referred to changed the short, thick, straight English scythe into the longer, thinner, curved implement with stiffened back now in use."

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Ancient and Modern Engineering and Architecture.*

The remark, "There is nothing new under the sun," is more axiomatic than the casual reader believes. We think that this is a very progressive age, and that our generation stands pre-eminent in civilization—is the highest known. This is so, but to state that we, in this age, are immeasurably superior to the ancients is, we think, incorrect. Our aim is not to prove our century inferior to the past ones, rather it is to present historical facts which will indicate that modern architectural and engineering works are merely reproductions of those of the ancients, though sometimes larger and more speedily erected, owing to better facilities.

The works of long ago compare very favorably with those of the present, and in some instances excel anything of our own time. Hardening copper for tools is one of the lost arts; we cannot manufacture the Damascus blade, nor do we know by what means the pyramids were erected. There are very few (if any) streets like one in Cordova, founded 152 B. C. It was perfectly straight, ten miles long, and illuminated by public lamps. Paris, which is said to be the best lighted city in the world, cannot surpass this wonderful street. Cordova was not without rivals. Granada, founded before Augustus; Seville, in its prime 590 B. C.; Toledo, taken by Maximus Flavius 193 B. C., vied with Cordova with its 200,000 houses and 1,000,000 inhabitants. This city of Cordova may not be a fair comparison, as its decay commenced when conquered by Ferdinand III., of Castile in A. D. 1236. Modern cities surpass the ancient in number rather than in magnificence.

A slight acquaintance with archæology is sufficient to show us that the Statue of Liberty Enlightening the World is a duplicate in principle of the Colossus of Rhodes. The former is to be erected upon Bedloe's Island in New York Harbor, in honor of fraternity between France and the United States. It is of copper, and the ascent to the head is made by inner staircases. The right arm is extended, grasping a torch, which will illuminate the harbor by electricity. The total height is 328 feet 11 inches; pedestal 177 feet 9 inches, leaving 151 feet 2 inches for the statue. This work of art was fabricated in France under the supervision of its projector, Bartholdi, who in all probability took his idea from the Colossus of Rhodes, which was also erected upon an island, the Rhodus, in the Mediterranean Sea, twenty miles from Lycia on the south coast of Asia. This colossus was of brass, and erected 300 B. C. in honor of Apollo. Historians tell us that the height was 125 feet, "with legs distended on two moles which formed the entrance of the harbor," said moles supposed to have been twenty feet apart, and ships sailed under the body on entering the port. The statue was hollow, and the legs were lined with large stones to counterbalance the weight. This colossus was the workmanship of Chares, a pupil of Lysippus, a celebrated sculptor of Greece. The Colossus of Rhodes was thrown down by an earthquake sixty years after erection. The brass made 900 camel loads, or 720,000 pounds. The Washington Monument is considered a grand work, but the work of putting a new foundation under the old one was far more wonderful than the building of the obelisk itself. This monument presents a smooth exterior, and is 555 feet in height; was commenced more than thirty-six years ago, and finished under Colonel Thomas Lincoln Casey, chief engineer and architect, December 6, 1884. This pile of stone is hollow, and capped by marble with a conical apex of aluminum. The Pharos of Alexandria was 450 feet high, and built upon an island. Alexander the Great gave his order for this structure 332 B. C. to a Macedonian architect, Dinocrates by name, who also connected the island with the mainland by an earth wall. This lighthouse differed from the Washington Monument in being highly ornamented, the stone was finely carved, columns and balustrades worked in the finest marble embellished the exterior. It was built in several stories, tapering toward the top. The ground floor and the two next were hexagonal; the next square, with towers at each corner, the fifth to the top was round, with an external winding staircase. The extreme top was open, so that sailors could see its night beacons. The Pharos at Alexandria was a work of art, a credit to Alexander, who commenced, and to Ptolemy Philadelphus, who finished it. The Americans have built the highest structure known to man, but it is barren of all art. There is quite a difference between building a lighthouse with carved marble on an island, and erecting huge stones perfectly smooth by machinery, inland, even to the height of 555 feet.

Both ancient and modern engineers and architects considered height as a great objective point. The Great Pyramid is 478 feet. Cologne Cathedral is 510 feet. Rouen Cathedral, 490 feet. The statue of San Carlo Borromeo, at Arona, erected in 1697, was 66 feet high, and the pedestal 40 feet. A marble statue of Nero was said to be 120 feet high. The walls of Babylon were 378 feet high, also 93 feet 4 inches thick, and in compass 60 miles. Herodotus, who was at Babylon, gives these figures; others give the height 50 feet, as they were after the time of Darius Hystaspes, who pulled them down to that height, that he might conquer the city again more easily, if necessary. The Chinese wall was much longer, being 1,250 miles, but very much inferior in width and height; only 20 feet high, 25 feet wide at the base, and 15 feet at the top; about one-third of the wall of China is dirt and rubbish, the rest being masonry, and it dates back to 220 B. C.

The Hanging Gardens of Babylon were built by Nebuchadnezzar to gratify his wife Amytis. The gardens were over 400 feet square, built terrace above terrace until they were 27 feet higher than the walls, or 400 feet. The top was sustained by a series of arches one above the other, and each terrace was bound by a solid wall 22 feet thick. On the top arches were first laid flat stones 16 feet by 4, over these weeds and bitumen; then two rows of cemented brick covered by sheet lead, upon which was laid earth sufficiently thick to nourish large trees. The gardens were filled with the blooming plants and shrubs which were admired by Queen Amytis in her native Media. The different terraces and groves contained fountains, parterres, seats, and banqueting rooms; in fact, all the splendor and magnificence of Eastern art seem to have been lavished upon these gardens by King Nebuchadnezzar in order that his Median bride should be happy in her new home. Pen cannot picture the grandeur of the conception or the perfection of the execution of these gardens, which have been and are the wonder of all ages. The greatest hanging structure now in existence is the Brooklyn suspension bridge, costing $15,000,000. The whole length is 3,475 feet, and it connects New York and Brooklyn by a clear span of 1,595 feet. It is 135 feet above low water mark and 85 feet broad, it has also two platforms, one above the other. The piers are stone masonry, hollow, and sunk below the surface by means of caissons. As the details of this work are formidable, it is sufficent to say that it is the greatest engineering feat known. John Roebling was the engineer.

One of the mysteries handed down to us is the manner in which the ancients manipulated those immense stones. Take the obelisk of Luxor, which stands sentinel over the Place de la Concorde, in Paris, 73 feet in length. Long continued manual labor could quarry it, but by what means it was conveyed to Luxor is still hypothetical; and the stones of the Pyramids, not one of which is less than thirty feet long by five thick, how could they be hoisted up 478 feet, or, rather, how were they, and by what means were these great blocks of granite transported from the quarry at Syene to the delta of the Nile, a land journey of six hundred or a voyage of seven hundred miles? Egyptologists have surmised many ways by which the Pyramids were built, but none of them seem satisfactory. No representations of derricks or hoisting machines have been bequeathed to us. Some writers say that the stones were raised by machines from step to step, others tell us that skids were used, still others that the external covering was laid from the top to the bottom. The great Pyramid Cheops covers at base about 555,000 square feet, and rears itself 478 feet. The first step is nearly four feet eight inches high; the top one, one foot eight inches. Mathematics were known in that day, as its angle was perfect at all sides, 51° 50′, also each stone was accurately fitted to another. Notwithstanding the difficulty in finishing granite, the stones of this royal tomb were finely polished. Chronologists differ as to the date of the reign of Cheops, the latest date given being 2123 B. C. Herodotus says that he "was informed by the priests of Memphis that the great Pyramid was built by Cheops, that 100,000 men were twenty years in building it, and that the body of the king was placed in a room in the bottom of the Pyramid." No king ever had a mausoleum so beautifully magnificent; beautiful in its simplicity, magnificent in its proportions. The Pyramid of Cephren is 684 feet square and 456 feet high. The Pyramid of Mycerinus is 330 feet at base and 174 feet high. There were many other pyramids built, but to all of them we can only say, "The eternal pyramids—the mystery of the past, the enigma of the present, and the enduring problem for the future ages of the world."

One thing the ancients did not attempt; at least there is no record of their building self-supporting domes prior to the church of St. Sophia, in Constantinople, originally built by Constantine, destroyed by fire, and rebuilt by Justinian. The dome is 175 feet high. St. Paul's, London, commenced in 1675 and finished in 1710, has a dome 145 feet in diameter and 365 feet from the ground. St. Peter's has the largest and highest dome known. This beautiful pile was commenced in A. D. 1450, and finished three and a half centuries after. The dome is 405 feet from the pavement, and 193 feet in diameter. The domes of the churches of St. Genevieve and Invalides, Paris, are also self-supporting.

Not even Dinocrates, who built Alexandria and the Pharos, also the Temple of Diana, attempted the difficult engineering feat of self-supporting domes. In constructing the Pyramids mathematics were known, consequently it was not ignorance which prevented the ancients from worshiping under a self-supporting vault.

The sewers of Paris are great works of skill, large enough to float inspection boats, but they do not surpass very much the Maxima Cloaca of Rome, thirteen feet broad and thirteen feet high, built by Tarquinius Priscus, 616 B. C. Athens had sewers which drained into the Saronica Gulf. Babylonian sewers drained its marshes into the Euphrates. Modern age has simply copied from the ancient. The principle is the same now as when the Alexandrian architect wished to build a temple to Arsinoe, in which he intended to suspend her statue by means of a loadstone. The only thing modern sanitation can claim over the ancient is sewers greater in length and number, owing to the greater needs.

Of aqueducts, the Croton of New York claims the honor of being the finest of our age. It is forty-two miles long, and thirty-three from Croton Lake to Harlem River. Lisbon aqueduct is twelve miles long; the one which carries the water to Paris, 110 miles. Ancient Rome had fourteen aqueducts. Three of these supply modern Rome—Aqua Virgo, about eleven and a half miles, built by Agrippa, to supply his baths; Aqua Claudia, forty-five miles long; and Aqua Trajana, twenty-three miles, built to supply inland basins for spectacular sea fights. Constantinople had its aqueduct of Pyrgos, fifteen miles long. The aqueduct supplying Athens had perpendicular pipes of clay or lead every 240 feet or so, leading up to the surface; by this contrivance light and air were admitted to the water. Eupalinus tunneled through a hill at Samos eight feet high, eight feet broad, and four thousand two hundred feet long, with an accurately reckoned declivity; also a channel at the bottom, three feet square, to carry the water, which was thereby aerated. Duplication of tunneling on a greater scale is found in Mt. Cenis, eight miles long, double tracks. It is twenty-five feet wide at the base, and twenty-four feet high. St. Gothard is nine and a half miles long. Hoosac is 25,040 feet, and Sutro 3·84 miles long. The last clearly parallels the Samos tunnel, being used to carry water from a mine. Some writers say that the Euphrates was tunneled under, but the statement is vague, and bears no authenticity.

The reservoirs of the ancients were not inferior to those of the present time. The expertness of the ancient engineers is attested by the remains extant; they certainly are not buried in the waters of the Lethe. The Pools of Solomon still continue to furnish water to Jerusalem. They are three in number. The upper is 160 feet above the middle one, the latter 248 feet above the lower. The first was supplied by pipes from springs, and, when full, emptied into the second, and that into the lower one. The water was used for irrigating Solomon's gardens and supplying his temple. The lower pool held about 31,442,425 gallons, the middle about 12,289,912, and the upper one contained 13,778,772—a grand total of 58,511,109 gallons, or nearly six times as much as the Kansas City reservoir, which is estimated at 10,000,000 gallons. These pools were solid rock and masonry, lined with cement, and had steps leading to the bottom. One historian says that Nebuchadnezzar, wishing to brick the bottom of the Euphrates, which flowed through the center of Babylon, caused a reservoir forty miles square to be dug, so as to allow his masons a dry river bed. Another historian writes that Nitocris, a daughter of Nebuchadnezzar, is said to have dug a reservoir 420 stadia in circumference, lined with stone, for the waters of the Euphrates, in order that the river bed at Babylon should be dry so that she could build piers for a bridge. A stadium being 625 feet, it would make this circumference forty miles. These two reservoirs may be the same, and this shows what discrepancies there are among writers.

The melting snows from the Armenian Mountains sometimes caused an overflow of the Euphrates, whereby the city of Babylon and the country surrounding suffered from inundations. It was therefore necessary to drain the country, and to prevent any future trouble two canals were cut west from Borsippa to the river Tigris, which makes these canals about seventy-five miles long. Ancient Greek authors attribute this work to the ruler who made the greatest city of ancient times, and one never excelled in any age—Nebuchadnezzar. There are many canals now of modern engineering, but few, if any, constructed to drain and to receive waters from overflowing rivers. The longest canal is the Erie, in New York State, 350½ miles long and 70 feet wide, finished in 1862. The largest canal is the Suez, authorized by Said Pasha in 1854, built by M. Ferdinand de Lesseps, and finished, or rather officially opened, in 1871. It is 100 miles long, of which 25 miles are lakes. Its width varies from 325 to 197 feet at the top, and is about 70 feet wide at the bottom; the depth varies from 30 to 85 feet. The Erie Canal entire cost nearly $46,000,000, while the capital stock of the Suez Company was $60,000,000. The United States leads all other nations in number of canals—forty-four altogether.

The length of this paper forbids our writing further, although the archæological fields are blooming with undescribed beauties of art. Many more comparisons could be made which would place the modern age in an unenviable position. Readers who have been our

* Extracts from a paper by Dr. R. Wood Brown, in the February number of the *Kansas City Review*.

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companions so far will notice many so-called errors, but when it is borne in mind the large number of historians and archæologists, also the difficulty of deciphering the writings of those whose sarcophagi have been violated, it will be apparent that dates and measurements, at the best, are merely approximate.

Sources of Electricity.

Professor Tyndall recently delivered the first of a course of Christmas lectures adapted to a juvenile auditory on "The Sources of Electricity," to a body of listeners which filled the theater of the Royal Institution.

The speaker stated that nine years ago he had lectured there on the subject of frictional electricity, but on the present occasion he intended to give a connected story of the whole subject, to show how the knowledge of electrical science grew up. No doubt all present were aware that the word "electricity" was derived from the Greek word "*electron*," meaning "amber," for the Greeks knew that amber when rubbed would attract light particles, such as small fragments of paper. Amber is found in Europe on the seashore of the Baltic, particularly after storms, and the people gather it among the seaweed; there are also fossil trees which once yielded amber; in fact, just as gum oozes out of the cherry tree at the present day, so did gum in those early times ooze from the amber tree. The two mouthpieces of pipes stuck together, which he held in his hand, had been in the Royal Institution he did not know how long, and when he rubbed them on a catskin, they saw that the amber attracted light particles of bran. The mind of man was never contented with mere facts, so the real question was, "Why does the amber attract the bran?" A great philosopher of those early days, Thales by name, supposed amber to possess a soul, and because of its soul it attracted bodies, and for the next two thousand years nothing more was known about electricity. In the year 1600, Dr. Gilbert, who lived in the time of Queen Elizabeth, remarked that amber was nothing but gum because it contained insects, so that other bodies might possess the same electrical power; he discovered many such, including glass.

The lecturer then balanced a lath, perhaps about four feet long by two inches wide, upon a pivot; he said that a watch glass would do as well, and that if a boy could not afford a watch glass, he could balance it on an egg in an egg cup. He then showed that a rubbed glass rod would attract one end of the lath, and would also attract a small broad rimmed paper wheel so as to make it run along the lecture table, following the tube as a carriage follows the horses. But a carriage was drawn by visible threads, while the paper wheel before them appeared to be drawn by invisible threads, as if it were harnessed therewith to the rod. Why was this? Sir Isaac Newton considered the problem in relation to the action of the sun upon the planets; he thought that there was something there, but was cautious not to say what it was. That same question was now before them; it was one of the most important which occupied the attention of scientific men, and perhaps they would not solve it in our day and generation.

The inventor of the air pump, a burgomaster of Magdeburg, made further discoveries in electricity. He found out that when a feather suspended by a silk fiber was touched by an excited glass rod, the feather was afterward repelled by that rod, but attracted by a rubbed rod of gutta percha. [Professor Tyndall no doubt meant sealing wax, as gutta percha was not known in Europe at that time.] Other rubbed resins also attracted the feather repelled by glass; hence arose the idea of two kinds of electricity. The lecturer then balanced a lath on a stem insulated by a cake of shellac and placed himself upon a stool insulated with glass legs; he next asked his assistant, Mr. Cottrell, to strike him several times upon the back with a cat skin, which amused the boys present, especially when he said, "Strike me again, if you please, Cottrell." By the friction of this mild flagellation, enough electricity was developed on the surface of the lecturer's body to enable his knuckles to attract one end of the balanced lath. Newton, he said, found his dressing gown to act better than other rubbers, and noticed that in obtaining frictional electricity much depends upon the character of the rubber. Professor Tyndall then suspended a stick of excited sealing wax by its center to a silk string, and showed that it was repelled by another excited stick of wax; two rods of gutta percha similarly repelled each other, and he said that the same effect could be produced by means of two paraffine candles. He excited an ebonite comb by drawing it several times through his hair, and showed that it would then repel a suspended comb; it was necessary that the hair should be dry. Resinous bodies, he added, repel each other electrically, but attract vitreous bodies; the conclusion, therefore, was that similar electricities repel each other, and opposite electricities attract each other. These electricities were once called "resinous" and "vitreous," but now "positive" and "negative," but they must bear in mind that there is no intrinsic reason why one of the electricities should be named positive or negative more than the other. The electricity from glass is called positive, and that from resins negative. He then showed the repelling force between bodies similarly electrified, by holding two pieces of silk ribbon at one end, and rubbing them down with the catskin; they then repelled each other, standing out in Λ-form. He next warmed a board, and warmed a sheet of foolscap paper, then applied friction to the latter upon the former with a piece of India rubber. The electrified paper adhered somewhat firmly to the board, and when, with a penknife, he cut out two strips of paper, and raised them from the surface of the board, they repelled each other. He also exhibited a great paper tassel, the ribbons of which repelled each other when electrified.

On two long, dry, narrow glasses he placed two brass balls, one on each glass, then electrified one of the balls with an excited glass rod; afterward, by means of a discharging rod, he momentarily connected one ball with the other, which thus, it was shown, acquired the power of attracting the balanced lath. The fact, he said, that electricity can thus be conveyed from one object to another first gave the idea of an electric current. The gold leaf electroscope was next brought under notice, and the method of using it. Professor Tyndall showed that frictional electricity would travel along a string, and cause the leaves of the electroscope to diverge, when the string contained but the moisture it had taken up from the air of the theater, but that when it was dried it could no longer conduct electricity. He passed a current also through a silk cord which had just been dipped in water; by these experiments showing the effect of moisture. He warmed most of the things used in the lecture, he said, merely to get rid of moisture, otherwise heat or cold would not interfere with his experiments. Placing two apples upon the two tall glasses, he said that in the eyes of scientific men positive and negative electricities were mixed together in those apples, but that this speculation should not fetter the minds of the listeners; nevertheless, it enabled experimentalists to predict results before they were obtained. He then held an excited glass tube near one of the two apples, which were touching each other, saying that the tube was supposed to attract the one electricity and to repel the other; he next separated the apples, and by the electroscope showed that one was charged with positive and the other with negative electricity.

An Undulatory Current in a Closed Circuit not Necessary for Telephonic Transmission.

Under the above heading the London *Electrical Review* publishes a communication, in which the writer details some experiments bearing upon this subject. He connected up a Boult (De Kraft) transmitter and receiver, using three medium size Leclanche cells connected to the carbon microphone through the automatic transmitter, in which he used a ribbon of paper having a line of small holes very close together, running longitudinally through the center, similar to the paper used by the Wheatstone instrument. The automatic transmitter was then put in motion, and the paper was passed over the metallic drum beneath the wire brush, which made the contacts through the holes in the paper, and allowed the current to pass on through the microphone at a speed of about 1,000 words in one minute. While this paper was passing, and the continuity of the current was continually broken, words spoken directly to the carbon microphone without the intermediary of a diaphragm, and without any substance whatever below the carbons, were distinctly heard from the receiver, and the articulation was as perfect as when the current was continuous. With these facts as a premise, the writer reasons that the closed circuit is not necessary for telephonic transmission, and that Bell's theory to the contrary is thus experimentally disproved.

A Distinction with a Difference.

For the last twelve months, more especially, strict conservatism has characterized the management of many departments of business. Producers, fearing the evil of overproduction, have taken good care to avoid overstocking the markets. The consumptive demand has been kept in full view, and the production of goods between seasons has been confined to such limits as to assure ready sale at the proper time. Producers, seeing that the middlemen refused to carry stocks not readily salable, and realizing the additional risks which such a course has imposed upon them, have interested themselves in the question of supply and demand more generally than ever before.

Under such circumstances, says the *Age of Steel*, it is but natural to expect that conservatism may at times overleap itself; indeed, that it has done so at times in the last year or two is a fact well known in trade circles. An occasional and short-lived advance on the price of this or that article, not referable in the slightest to speculative influences, shows how near together consumption and production have latterly been. True, there is a large producing capacity now unemployed, but readily available, with which to meet the demand for any and all manner of manufactured goods; and it is this fact, not actual overproduction of goods, that darkens the business sky like an overhanging cloud. The country is overburdened with manufacturing facilities, not with manufactured goods.

An Impromptu Ice Palace.

BY H. C. HOVEY.

On one of the coldest nights of this remarkably severe winter the entire fire department of Minneapolis was called out by an alarm from the Academy of Music block. The building was large and costly, with its contents being estimated at $225,000; and its location, on the corner of Washington and Hennepin Avenues, was such as to make a wide conflagration probable, in case the fire should get beyond control. Hence, although the mercury stood at thirty degrees below zero, the whole force was called, and thousands of people stood in the streets and on the house tops watching results. Six powerful pumps, with a united capacity of thirty million gallons a day, supply the city with water from the Mississippi River; and by a system of gates and distributing apparatus, fire pressure may be put on at any instant and concentrated where it is needed. The department also has a number of excellent steam fire engines, and a force of about one hundred men. With these facilities, and knowing the importance of preventing the spread of a blaze that might cost millions of dollars in a few hours' time, the firemen deluged the Academy of Music with torrents of water, that for the most part seemed to freeze as it fell. The surrounding network of telegraph wires broke the smaller streams into spray, that coated the burning building with frost. By using a combination nozzle four of the largest streams were consolidated into one, and thus the interior of the block was reached. Part of this huge volume of water was changed into vapor, and part into ice. At one time the singular spectacle was afforded of an ice palace blazing like a volcano, and overhung by a vast cloud of rising steam that was transformed into hail and sleet as soon as it reached the colder atmosphere above. Finally the fire yielded to the flood and the frost, and although the Academy itself was in ruins, the conflagration was prevented from spreading further.

The next day the scene was visited by thousands of spectators. Photographs were taken both of the exterior and interior, from which the fantastic results can be imagined. The roof had partly fallen in, carrying the inner galleries with it. Heavy timbers had crashed through to the ground. The costly law library of the Minneapolis Bar Association was a complete loss. The four outside walls seemed to be intact, though since condemned as unsafe and now being torn down. But what interested visitors most of all was the grand spectacle of the extempore ice palace thus reared in a night. The whole building was wrapped in a heavy mantle of ice descending in graceful folds from the Mansard roof to the pavement. Huge icicles, many yards long, hung like great stalactites; while smaller ones festooned the cornices and decorated every part of the burnt and blackened walls. The sidewalks and streets were barricaded by banks of solid ice, white as marble, and almost as firm in its texture. These banks varied from ten to fifteen feet in thickness. The starting office of the city street cars is here, and consequently the entire lines of travel of that sort were disarranged. The tracks lay embedded in ice that could only be cleared away by the labor of many men for many hours. Myriads of icicles were suspended from the interlaced and twisted telegraph wires.

The interior view was even more striking and beautiful. The remaining staircases and balustrades were coated with discolored ice, resembling Mexican onyx or the mottled alabaster from Luray Cave. The heaps of fallen rubbish in the courts below were incrusted with crystals like the frozen billows of some Arctic sea; while from the charred rafters and swaying gas pipes bending above them hung fantastic ornaments, reminding one of crystal chandeliers. Through all this fairy-like scene the brilliant sunshine from a cloudless Minnesota sky made its way, reflected from a million diamond points, and here and there showing prismatic colors. Hardly an object of any sort was visible that had not, in some manner, been thus glorified. Even the scattered fragments of furniture, the splintered beams, the torn and dismembered volumes of the lamented law library, were all congealed into so many pieces of marble.

The basement was occupied by the largest clothing store in the Northwest; and the coats, vests, and other garments, frigid with ice, stood out from the walls, or lay in half burned heaps, in every grotesque shape imaginable.

An unusually heavy fire pressure was on at the pump house, the gauge registering 122 pounds, and it was afterward discovered that as a consequence the water mains on Washington Avenue were, some of them, burst.

The picturesque ruins, after having stood for a while to be admired by the public, will be torn down altogether, as the inspectors have decided that the walls are unsafe and must be removed.

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ENGINEERING INVENTIONS.

A car signal has been patented by Mr. Florance P. Day, of Omaha, Neb. A vertical shaft is held at each side of the car, the shafts carrying devices for producing flashes of light, one shaft revolving when the car is running in one direction and the other when the car is running in the opposite direction, the shafts being revolved from a car axle.

A steam boiler and furnace has been patented by Messrs. James D. Randall and William A. King, of Memphis, Tenn. This invention relates to boilers and furnaces designed for burning smoke, atomizing and burning animal and vegetable matters, oils, etc., by commingling steam with hot and cold air and with the oil or gases evolved from the water in the boiler in the process of generating steam.

A car coupling has been patented by William Jasper Hadden, of Danville, Ill. It is designed to work automatically, and to hold the pin set ready to drop, to guide the link into the drawhead, to drop the pin through the link when two drawheads bump together, and to raise the pin when desired, it being possible to set the coupling from either side, so the cars will couple automatically on coming together.

A water tower has been patented by Mr. John B. Logan, of Baltimore, Md. This invention provides a special construction and devices for carrying on a truck a tower which shall support a pipe or nozzle at any angle or elevation and of horizontal rotation, to lengthen the pipe and secure it while under water pressure, to fix the truck on the ground when in use, and to carry the end of the suspended hose while not in use.

A car coupling has been patented by Mr. John W. Fergusson, of Sardis, Miss. This invention consists in particular constructions of the drawhead with a coupling stud fixed to the floor of its link socket, and an opposing stud pendent from a hinged cap plate, with an uncoupling device behind the studs, adapted to lift the upper stud from the lower one, and raise the end of the link to allow the cars to be separated, with other novel features.

MECHANICAL INVENTIONS.

A metal shears has been patented by Mr. Gilbert McDonald, of Augusta, Kan. This invention consists in a special construction and combination of parts to improve that class of hand shears in which a plain and eccentric lever are combined and connected with the movable jaw for acting on the latter with great force.

A machine for rolling axles, spindles, and other metal article, has been patented by Marie E. Shay, of Fordham, N. Y. This invention consists in a novel method of and means for forging metal blanks by subjecting them to the action of a rotating die and a stationary or flat die, one die being adjustable toward the other to give the necessary pressure, and the rotating die preferably having oblique corrugations or grooves on its acting surface.

AGRICULTURAL INVENTIONS.

A plow has been patented by Mr. Thomas A. Blanchard, of Appling, Ga. This invention covers a peculiar construction and arrangement of parts of a plow in which various portions are adjustable in such a way that the plow can be adapted for a great variety of work.

A horse hay fork has been patented by Mr. Robert L. Short, of Janesville, Wis. With a slotted shank and tripping rod are pivoted tines, the tines adapted to enter the hay points downward, and to be reversed by the action of the hay as the fork enters, and then be extended by the hay as the fork is withdrawn.

A land marker has been patented by Mr. William H. King, of Little Silver, N. J. A hub on the shaft at the inner side of a wheel has an arm with roller and keeper to engage with the plow raising lever and catch lever, a lug to receive the brace bar, and the adjusting bar connected with the tongue, and a long bearing to receive the pivot of the marker bar, with other novel features.

A band cutter and grain feeder for thrashers has been patented by Messrs. George Neukomm, Louis Neukomm, and David Neukomm, of Tremont, Ill. This invention consists of special combinations of parts and their construction, its object being to provide a mechanism for cutting the bands of grain bundles and feeding the grain to the thrasher in a regular and uniform manner.

MISCELLANEOUS INVENTIONS.

A time register for seats has been patented by Mr. Charles W. Allen, of Valentine, Neb. This invention consists in a special construction and arrangement of parts, in connection with clockwork, for the purpose of automatically registering the time a seat has been occupied.

A coal chute has been patented by Mr. Moses D. Jones, of Jackson, Ohio. This invention provides for the use of a swinging chute, to be filled with coal while in a nearly level position, and then lowered for the discharge of its load into the car, so the coal will not be broken up, as is so frequently now the case with inclined chutes.

A wire basket has been patented by Mr. William H. Elliott, of Texarkana, Tex. It has a circular bottom and a wire frame bent to form a cylinder, the circular bottom being held in the lower part of the cylinder, so the basket can be taken apart and folded compactly, but is light, strong, and durable, and especially adapted for collecting cotton.

A safety belt has been patented by Mr. Edward J. Claghorn, of New York city. It consists of an outer and inner belt, with various attachments for ropes, straps, suspension hook, etc., to be applied to the person for securing one to a fixed object, or to assist in ascending and descending, and is especially designed for firemen, tourists, telegraph men, etc.

A nut lock has been patented by Mr. William H. Dinsmore, of Connellsville, Pa. This invention relates to gang nut locks for railways, where a plate or bar is adapted to be fitted over the nuts after they are screwed up, and provides a device which shall inclose each of the nuts snugly, and can be easily placed on them.

A gate latch has been patented by Mr. Robert Magruder, of Liberty Hill, Texas. This invention covers a special construction and combination of parts for the purpose of compensating for shrinkage of the gate in dry weather and its swelling in wet weather, so that the bolt or latch may at all times extend the right distance to properly engage the gate post.

A measuring jacket has been patented by Mr. Hermann Lingen, of Wheeling, West Va. This invention covers an improvement on a former patented invention of the same inventor, there being an extensible and adjustable frame held on and between the edges of one of the seams, so enlarging or decreasing the size of the jacket as may be necessary.

A watchmaker's tool has been patented by Mr. Hiram P. Pruim, of Grand Haven, Mich. It is a combination tool, with a screw driver and tweezers attached to a ring at a little distance from and nearly at right angles with each other, so that both implements will be in convenient position for use when the ring is placed on the forefinger of the operator's hand.

A thill coupling has been patented by Messrs. Erwin A. Galatian and John B. Taets, of South Westerlo, N. Y. This invention consists principally of jaws having upon their inner sides circular or annular projections, combined with a hook eye having a groove or recess in each end, so the shafts can be coupled and uncoupled rapidly, and to prevent their rattling.

A monocycle has been patented by Mr. Francis E. Mills, of Pittsburg, Pa. It is a vehicle designed to be driven by a person standing erect within the wheel, which should have an outside diameter about eighteen inches greater than the height of the one who is to operate it, the invention also covering novel devices of construction and arrangement of parts.

A scarf, necktie, or cuff holder has been patented by Mr. Lewis F. Ward, of Marathon, N. Y. The invention consists in an open slotted elastic holder or device for use as a detachable appendage to collar and cuff buttons for holding scarfs, cuffs, or ties in proper position, the same device being applicable to each of the articles.

A bridle bit has been patented by Messrs. John R. Brott, of East Medway, and Martin L. Andrews, of Melrose, Mass. It is so made that a connecting bar passing through the mouth is dispensed with, side hooks being used instead, inserted between the teeth and cheeks, and connected and formed integral with a curved bar that passes around the under jaw of the horse.

A jute machine has been patented by Mr. John C. Delavigne, of New Orleans, La. According to this invention, the green stalks are subjected to a heating and fermenting process, and then after drying are run through a specially devised machine, to separate the woody fibers from dry jute and ramie without wetting or soaking the stalks as usual, and thus avoid the objections to working jute or ramie in a green state.

An animal trap has been patented by Mr. Robert Jessee, of Locust Lane, Va. It consists of an upper chamber, with rotary partition and pivoted floor or treadle for controlling it, a cover hinged to the top of the chamber, and a lower chamber hinged to the lower part of the upper chamber, with other novel features, to prevent the escape of animals back to the opening when they have once entered.

A car window shade has been patented by Mr. Gideon B. Massey, of Mount Vernon, N. Y. Combined with the shade roller and shade is a vertically slotted guide standard, into the slots of which the ends of a strip secured on the free end of the curtain pass, cords or wires from the corresponding ends of the strip and roller passing over suitable pulleys, so the shades can easily be held in any desired position.

A filter has been patented by Mr. Alonso Cardoso de los Rios, of New Orleans, La. A large open tank has layers of charcoal, fine and large sand, and stones resting upon a false iron grating bottom, under which is a chamber, and up through which and through the filtering material the water passes, being partially freed from sediment by an agitating wheel in the chamber beneath the false bottom.

A hand propeller for boats has been patented by Mr. Michael Batz, of Brooklyn, N. Y. The propeller shaft carries a pinion or cog wheel, and a sliding transverse shaft carries gear wheels alternately moved into and out of gear with the propeller shaft pinion; there are spring actuated pulleys supported upon fixed gudgeons, and hand levers with strap connection with the pulleys, with other novel features.

An elevator has been patented by Mr. Charles W. Hays, of Orange, N. J. The carriage has a groove in its floor and there is a corresponding groove in the floor of the building to receive the arms of a bar attached to the well door, so the carriage will be locked when the door is opened and released when closed, making it impossible for the door to be left open when the elevator carriage moves away from it, and thus guarding against accident.

A door knob attachment has been patented by Mr. Nathan Hawkes, of Appleton, Me. This invention relates to inside fastenings for knob spindles in which a sliding plate, having a keyhole slot therein, is adapted to be moved in and out of position, for holding the spindle from turning, and adapts such locking plate to be operated by a slight movement of the hand, and to be held in both locking and unlocking positions by either friction or gravity.

A window screen has been patented by Mr. Jay R. Graver, of Lincoln, Neb. The side pieces of the frame are collapsible inward toward the center of the screen, the top bar or piece being rigidly secured to the window frame, while the bottom bar is loose, so the screen may hang like a curtain, and be collapsed toward the center from either side, in order to reach the window when the side pieces are disengaged from hooks.

A paint distributer has been patented by Mr. Wilbur I. Armstrong, of Belvidere, Ill. It has a spoon-shaped receptacle for receiving the liquid to be distributed, into which a feeder projects formed of two spring strips, between which the liquid is drawn by capillary attraction, and then distributed by a current of air, there being an air receiver through which the compressed air passes, so the air will be moistened to keep the parts of the distributer clean.

A gas machine has been patented by Mr. William C. Strong, of Readfield, Me. This invention relates to machines in which gas is made by carbureting air with a volatile liquid, such as gasoline, the air being driven through the carburetor by the descent of a bell into a water tank, the gasoline receptacle, carburetor, and other parts being jacketed within the bell, and provides a simple, portable machine, to vary in size or capacity as required.

A watch balance has been patented by Mr. Johann E. A. Uhrig, of London, Middlesex County, England. This invention relates to an improved continuous secondary or auxiliary compensation for the balances of chronometers, watches, etc., to eliminate the errors which occur at the extremes of temperature when the balance is adjusted for medium temperatures, so combining curved springs with the rim of the balance as to cause the segments of the compound rim to move in an accelerating ratio toward the center of the balance as the temperature rises, and the increase being capable of regulation.

A fire escape has been patented by Mr. Robert H. Nichols, of Aylesford, Nova Scotia, Canada. The sides of the ladder support are of light but strong framework, and a drum is journaled at each end of the frame, with grooved notched wheel, over which an endless chain ladder passes; if the bottom drum is turned in one direction or the other, the upper part of the ladder will be moved upward or downward, and the lower part in the inverse direction, there being also levers, brake shoes, and other novel combinations of parts, for the purpose of lowering persons, etc., from burning buildings.

NEW BOOKS AND PUBLICATIONS.

LES TORPILLES. Par Lt.-Colonel Hennebert.

This work of 279 pages on the subject of torpedoes is quite profusely illustrated with 82 wood engravings. It treats at the opening of the experiments of Bushnell with the stationary barrel torpedo at the time of our revolution, and also of Fulton's and Colt's early experiments in the same line. The gradual evolution of the torpedo from the small anchored floating buoy to the automatic cigar-shaped submarine propeller is then described, and the subject is elucidated by clear descriptions and artistic drawings. Several chapters at the end of the book are devoted to the service that has been done in recent wars by the use of the torpedo, and considerable prominence is given to the impulse which was given to this system of warfare by our civil war. Librairie Hachette et Cie., 79 Boulevard Saint Germain, Paris, France.

L'ANNEE ELECTRIQUE. Par Ph. Delahaye. Premiere Annee.

So great and wonderful are the discoveries and inventions which have been made in electricity within the past few years that the public have had some difficulty in keeping pace with the progress made, and as a natural consequence the demand for literature upon this almost inexhaustible theme has been very considerable. This work, the title of which is given above, is designed to supply this demand annually by giving a review of the development in the various branches during the preceding year. The work is written in a pleasant, descriptive style, and is comparatively free from technicalities. Besides dwelling at length upon the industrial progress of electric lighting, the telephone, the telegraph, and the application of electricity as a motive power, in connection with railroading and ballooning, a section of the work is given up to experiments made in France in resuscitating dead bodies, in suppressing cholera germs, in employment of electricity as a bait in sea fishing, in its use in mining, astronomy, etc. It is a work of 312 pages, and may be had of Messrs. Baudry et Cie., 15 Rue des Saints-Peres, Paris, France.

ARCHITECTURAL PERSPECTIVE FOR BEGINNERS. By F. A. Wright, architect. William T. Comstock, New York.

This book is intended mainly for draughtsmen who are obliged to educate themselves. It has eleven plates of practical examples, to make clear the application of theoretical principles. How to shade a perspective is also touched upon, and all the minutest details of the arehitect's work are shown and explained.

SPONS' MECHANIC'S OWN BOOK. A manual for handicraftsmen and amateurs. E. & F. N. Spon, London and New York. $2.50.

This volume of 700 pages, with numerous illustrations, aims to cover a wide field, the index of subjects referred to covering more than twelve pages of small type. First the raw material is treated of, its characters and variations, and then the tools used in working up such material, the book being intended to form a complete guide to all the ordinary mechanical operations.

THE PHOTOGRAPHIC TIMES, published by the Scovill Manufacturing Company, has now reached its fourteenth volume. The bound copies of the numbers issued in 1884 make a volume of large proportions, giving a general view of the twelve months' work done in this field, from the artistic and technical as well as from the commercial point of observation.

THE YEAR BOOK OF PHOTOGRAPHY, edited by Thomas Bolas, F.C.S., and published by Piper & Carter, London, England, is not only valuable as a guide for the beginner, but has much that is most convenient for reference to the advanced practitioner. Its numerous hints, jottings, and recipes are obviously the results of a wide experience.

Special.

SLEEP FOR THE SLEEPLESS.

It was Coleridge who put in the mouth of that quaint old genius, the "Ancient Mariner," the words:

"O sleep, it is a blessed thing,
Beloved from pole to pole."

The man who regularly enjoys sound and refreshing sleep has no adequate conception of all these words imply. It is to the sufferer who in sleepless weariness tosses on his bed half the night, and toward daylight snatches a little unsatisfactory slumber, that their full meaning is apparent. The man who digests well and sleeps well can stand almost any amount of hard work. It is not work that kills people; it is worry. The work that is followed by restful sleep brings good health and strength; for the daily waste of the body is repaired during the night. But the worry that oppresses the victim of insomnia during a sleepless night is what racks the system, wears out the muscles, torments the nerves, and bewilders the brain, so that life seems hardly worth living.

"Insomnia" is a growing evil. In this busy age, when active men are all the time overworking themselves, there are five times as many people tormented with inability to sleep as there were a generation ago. We are living under higher pressure. "Insomnia" is of different kinds, and proceeds from different mental any physical causes. But most of it may be summed up as to character in the words "can't sleep," and as to cause, in indigestion or overworked brain and nerves.

A most marked case of insomnia and recovery from it is that of Arthur Hagan, Esq., the well known wholesale tobacconist, of Philadelphia. Mr. Hagan is one of the largest dealers in tobacco, and is the Philadelphia representative of the great Baltimore house of G. W. Gail & Ax. In the interest of those who are inquiring the best way to secure sound sleep, and to triumph over the torments of insomnia, one of our editors called on Mr. Hagan at his store, on North Front Street. If he had been looking among a party of gentlemen for one who had been badly run down by dyspepsia and insomnia, Mr. Hagan would not have been the one selected. That gentleman now looks in such excellent physical condition that nobody would suppose him ever to have suffered from a day's illness or a night's loss of rest. In response to questions as to his past and present experience, Mr. Hagan said to our editor:

"My case was one of severe and long continued insomnia, proceeding largely from dyspepsia, the result of too great application to business. My system was very badly run down. Sleep became almost an impossibility. My physical distress during the night from being unable so secure refreshing slumber was dreadful. It weakened and distracted me during the day, and made attention to business a slow martyrdom. For five or six years I was from time to time under the care of different physicians, receiving occasionally some measure of benefit, yet on the whole gaining no material advantage. I was put on very low and simple diet, consisting principally of skimmed milk.

"After passing through a long variety of experiences as to physic and diet, I one day happened to pass the office of Drs. Starkey & Palen, and I noticed the sign of 'Compound Oxygen.' As other modes of treatment had failed, I thought this one could do no worse, and it might do better. So I went in at a venture, and made trial of it. For some time I had been enduring the agony of dyspepsia, and for weeks I had not been able to sleep without the aid of chloral or other drugs. The Oxygen did not work an immediate miracle in me. But I soon saw that it was doing me good, and so I resolved to persist in its use and to give it a thorough trial. Before long I began to know the pleasure of real sleep. It was by degrees that my dyspepsia left me, and the power to sleep returned. I was greatly encouraged by my partial improvement, and this stimulated me to go on with great regularity and persistence. If my recovery was slow, it was real. I had the best of home nursing and attention, and that was, of course, a material aid to me. For several months I regularly took the Compound Oxygen Treatment, carefully obeying the directions, and constantly gaining strength and freedom from disease. My system received the vitalizing which it so badly needed.

"About two years ago this took place, and I have enjoyed a prime condition of health since. I have been able to attend with pleasure and satisfaction to my business. I have no need now to resort to the Compound Oxygen Treatment, except occasionally for a cold or for some other temporary disorder. I take an abundance of exercise, and I eat and sleep as well as a man can wish to.

"I have recommended Compound Oxygen to a number of friends, who have tried it with entire satisfaction. My friend, Mr. E. W. Edwards, of this city, is notably one of these. He was badly run down by Bright's Disease and other infirmities, but was brought into good shape by the Compound Oxygen, and is now attending to business with ease and comfort. As a complete vitalizer of the system, the Oxygen is all that can be desired. It drives out disease by restoring vitalaction and putting the system in such a state of strength that disease has no chance to stay."

The reader will naturally seek more information on this interesting subject. It can be had in a pamphlet which is published by Doctors Starkey & Palen, 1109 and 1111 Girard Street, Philadelphia, and which will be mailed to any address on application.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Large Size Universal Milling Machine. Especially designed for Steam Engine and Locomotive Builders. Brown & Sharpe Mfg. Co., Box 469, Providence, R. I.

Air Compressors, Rock Drills. Jas. Clayton, B'klyn, N.Y.

Inventors having American or Foreign Patents for sale address Chas. Babson, Jr., 24 Congress St., Boston, Mass.

Leggins.—All varieties, shapes, and sizes on one machine. Lamb Knitting Machine Co., Chicopee Falls, Mass.

Extra Heavy Lathes, Planers, Drills; new designs. Pond Machine Tool Co., Worcester, Mass.

A lot of new Chucks of all sizes, slightly damaged, at half price. A. F. Cushman, Hartford, Ct.

The Whittenton Mfg. Co., Taunton, Mass., have 100 H. P. Electric Dynamo, line shafting connected by our Friction Clutches without stopping engine. Volney W. Mason & Co., Providence, R. I.

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The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Penna.

To Manufacturers.—I wish nut lock patent, No. 310,985, manufactured on royalty. See notice and cut on another page. J. A. Campbell, care "Banner," Brenham, Texas.

Experimental Tools and Machinery Perfected; all kinds. Interchangeable Tool Co., 313 North 2d St., Brooklyn, N. Y.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

The leading Non-conducting Covering for Boilers, Pipes, etc., is Wm. Berkefeld's Fossil Meal Composition; ¾ inch thickness radiates less heat than any other covering does with two inches. Sold in dry state by the pound. Fossil Meal Co., 48 Cedar St., N. Y.

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The Providence Steam Engine Co., of Providence, R. I., are the sole builders of "The Improved Greene Engine."

Every variety of Rubber Belting, Hose, Packing, Gaskets, Springs, Tubing, Rubber Covered Rollers, Deckle Straps, Printers' Blankets, manufactured by Boston Belting Co., 226 Devonshire St., Boston, and 70 Reade St., New York.

Experimental Machinery Perfected, Machinery Patterns, Light Forgings, etc. Tolhurst Machine Works, Troy, N. Y.

Bermuda Scientific Collections. Naturalist, Box 3359, N. Y.

Whistles, Injectors, Damper Regulators; guaranteed. Special C. O. D. prices. A. G. Brooks, 261 N. 3d St., Phila.

Brush Electric Arc Lights and Storage Batteries. Twenty thousand Arc Lights already sold. Our largest machine gives 65 Arc Lights with 45 horse power. Our Storage Battery is the only practical one in the market. Brush Electric Co., Cleveland, O.

The Cyclone Steam Flue Cleaner on 30 days' trial to reliable parties. Crescent Mfg. Co. Cleveland, O.

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Stationary, Marine, Portable, and Locomotive Boilers a specialty. Lake Erie Boiler Works, Buffalo, N. Y.

Wanted.—Patented articles or machinery to manufacture and introduce. Lexington Mfg. Co., Lexington, Ky.

"How to Keep Boilers Clean." Book sent *free* by James F. Hotchkiss, 86 John St., New York.

Mills, Engines, and Boilers for all purposes and of everydescription. Send for circulars. Newell Universal Mill Co., 10 Barclay Street, N. Y.

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121 Chambers and 103 Reade Streets, New York.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

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Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty, St., New York.

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Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Curtis Pressure Regulator and Steam Trap. See p. 93.

Woodwork'g Mach'y, Rollstone Mach. Co. Adv., p. 94.

Drop Forgings, Billings & Spencer Co., Hartford, Conn.

Munson's Improved Portable Mills, Utica, N. Y.

Anti-Friction Bearings for Shafting, Cars, Wagons, etc. Price list free. John G. Avery, Spencer, Mass.

Brass & Copper in sheets, wire & blanks. See ad. p. 92.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 5,000 Gear Wheels now in use, the superiority of their Castings over all others. Circular and price list free.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Friction Clutch Pulleys. D. Frisbie & Co., Phila.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 93.

Lane's Patent Self-measuring Faucets for molasses, oil, varnish, etc. Lane Bros., Box 276, Poughkeepsie, N. Y.

Stay bolt taps, true in pitch and straight. Pratt & Whitney Co., Hartford, Conn.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 62.

Catalogue of Books, 128 pages, for Engineers and Electricians, sent free. E. & F. N. Spon, 35 Murray Street, N. Y.

The best Steam Pumps for Boiler Feeding. Valley Machine Works, Easthampton, Mass.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Minerals sent for examination should be distinctly marked or labeled.

(1) J. H. C.—The developer which has been found to work well on plates coated with Mr. Henderson's emulsion is as follows:

No. 1.

Sal soda	4 oz.
Sulphite soda	3 oz.
Water	32 oz.

No. 2.

Pyrogallol	½ oz., 218 grs.
Oxalic acid	35 grs.
Water	5 oz.

Dissolve the oxalic acid in water, then add the pyro. To develop a large plate, take 2½ oz. of No. 1, add 3½ oz. of water, and 1 drachm of No. 2.

(2) J. D.—The anthracite coals vary from 39 to 42 cubic feet to the ton. The bituminous coals vary from 41 to 49 cubic feet to the ton.

(3) J. C. C. writes: Suppose a cannon one mile long is put on car wheels and placed on a railroad track, the cannon being loaded with powder sufficient to drive a ball one mile a minute; attached to the car wheels at the breech of the cannon is an engine, with power sufficient to draw the load one mile a minute. Supposing it possible to start them both at the same instant, the powder driving the ball one way, and the engine drawing the cannon in the opposite direction. How far will the ball be at the end of the first minute from where it started—one mile or two miles—with relation to the cannon? A. If the gun backs down a mile in one minute, and the ball moves along the gun at the rate of one mile in one minute, the ball will remain stationary in regard to the earth; in fact, the gun runs away from the ball. The ball will be in the mouth of the gun at the end of a minute.

(4) E. S. N.—Steam follows the same law as the atmosphere and gases relative to sudden compression and expansion.

(5) W. G. W. asks: 1. How to grind out the mouths of vials and bottles, so that the corks will fit tightly for holding alcohol and other volatile things? A. Glass stoppers can be made to fit tightly by grinding with emery. This operation can be performed either by hand or on the wheel. 2. Is there any known solvent for charcoal? A. Charcoal is described by Storer as "insoluble in water, alcohol, ether, or in dilute acids or alkaline solutions."

(6) "Steam Fitter" writes: A few days back I had a controversy with an engineer in charge of a steam heating plant. A No. 3 Blake pump is used to return water from hot well to boilers; hot well about six feet above pump; pump would jerk a little as it started back on its stroke; to remedy this, engineer puts on what he calls an "air chamber" on suction pipe, and contends that said air chamber—*vacuum* chamber I call it—will be full of air, and that as the water floods the pump it will cushion on the air and stop the jerk in the stroke. I contend that the air will be exhausted from the chamber, and as the cylinder fills with water a partial vacuum is formed in the chamber, provided the pump is running fast, and that the shock is relieved by the water filling the vacuum. The jerk in the stroke I think is caused by the water being very hot and partially vaporizing as it flows into the cylinder. Which, if either of us, is right? A. "Steam Fitter" is correct, and engineer may also be said to be correct, as air chamber is a common designation for these appliances.

(7) S. B. G. writes: It is said the Old Liberty Bell was cast in London about the year 1751; but when it reached Philadelphia it was found to contain too much copper, and a second casting was necessary; after which, in the first week of June, 1753, it was hung in the belfry. Please inform me whether it was cast the second time in Philadelphia or in London; and was the same metal used? Also, what was the cause of it being cracked? A. The now famous "Liberty Bell" was imported from England in 1752; it was cracked on trial by a stroke of the clapper, and recast in Philadelphia under the direction of Isaac Norris, to whom is attributed the putting on of the inscription from Leviticus xxv., 10: "Proclaim liberty throughout all the land, unto all the inhabitants thereof." Immediately beneath this is added: "By order of the assembly of the province of Penna. for the State House in Phila." Under this again, "Pass & Stow, Phila., MDCCLIII." In 1777, during the occupation of Philadelphia by the British, the bell was removed to Lancaster. After its return it was used as a State House bell, but was finally removed to Independence Hall. Its last ringing, when it was cracked, was in honor of a visit of Henry Clay to Philadelphia.

(8) J. H. D. asks how the periods of maturity of people inhabiting the different tropical, temperate, and arctic zones compare. In which section is average longevity the greatest? A. Temperate zone.

(9) C. A. S., Jr., asks how to make a dip for brass buttons to darken them, say shade nearly same as dark bronze or Florentine bronze? A. One part oxide of iron, one part white arsenic, twelve parts hydrochloric acid. Clean the brass well to get rid of lacquer or grease, and apply with a brush until the desired color is obtained. Stop the process by oiling well, when it may be varnished or clear lacquered.

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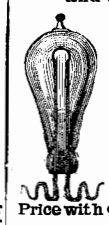

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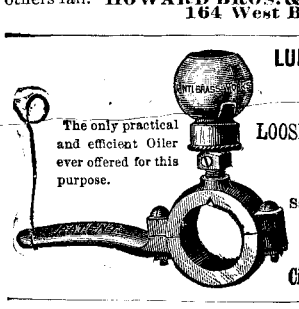

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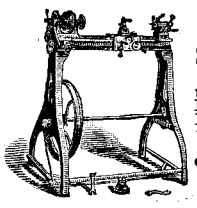

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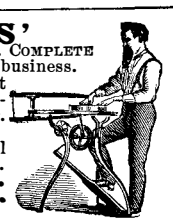

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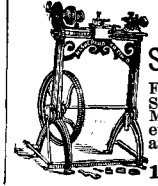

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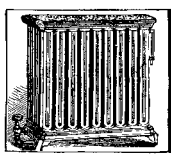

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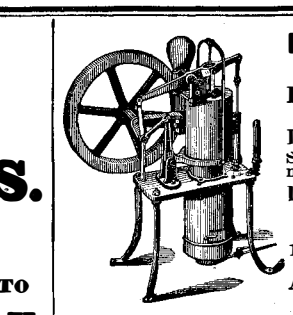

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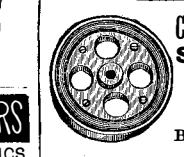

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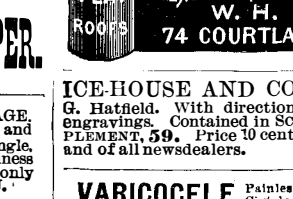

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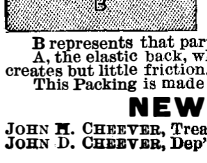

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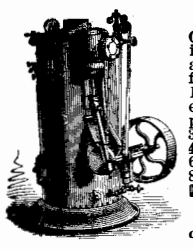

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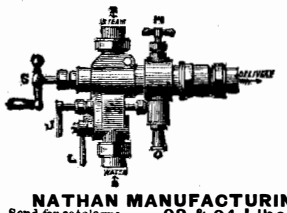

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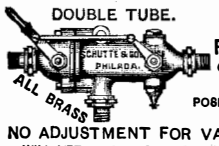

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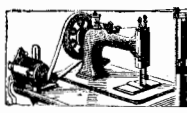

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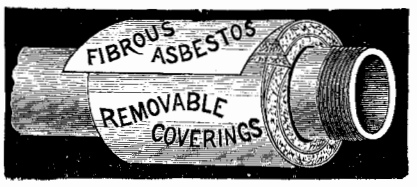

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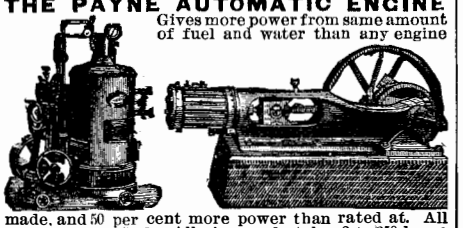

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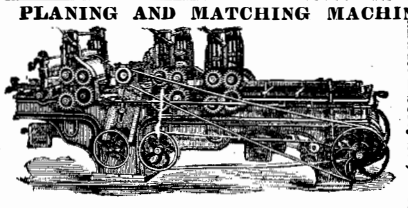

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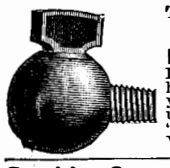

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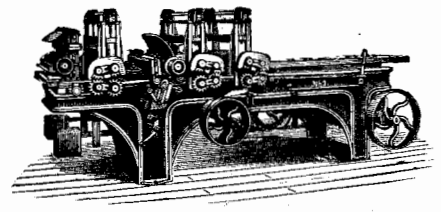

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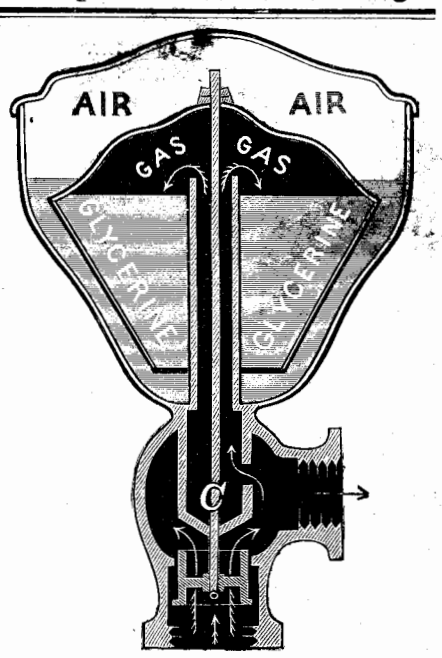

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Constructed entirely of brass; no rubber nor leather "diaphragms" to be eaten up by gas and acids. No mercury to poison the atmosphere.

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Ask our thousands of patrons, the press, the pulpit; the stage, and highest corporate, mercantile, and expert authorities, who have "tested their virtues" for the past three to five years. $50,000 sales for first twenty days January, 1885 (in every State of the Union), would indicate that they have achieved a well-merited and "world-wide" reputation.

THE

National Gas Saving Co.,

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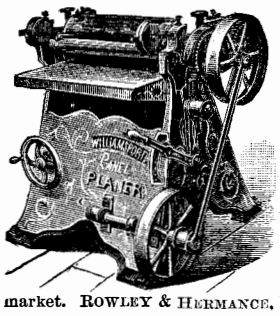
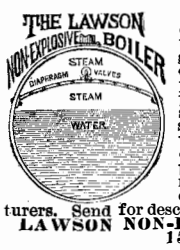
Wheels and Rope for conveying power long distances. Send for circular.



WILLIAMSPORT Pony or Panel Planer. For general use in Door Shops, Box and Furniture Manufactories. For planing Door Panels, Cigar Box Stuff, and Furniture work, it has no equal.

We use the Ellis Patent three part Journal Box and a solid forged steel head. Two pressure bars. Has strong feed. Will plane from 1-16 to 6 inch thick. Weight, 1,400 lb. The lowest priced first-class planer in the market. ROWLEY & HERMANCE, Williamsport, Pa.

BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay Guanos, Oil Cake, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Cocoanut, Flaxseed, Asbestos, Mica, etc., and whatever cannot be ground by other mills. Also for Paints, Printers' Inks, Paste Blacking, etc. JOHN W. THOMSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.



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